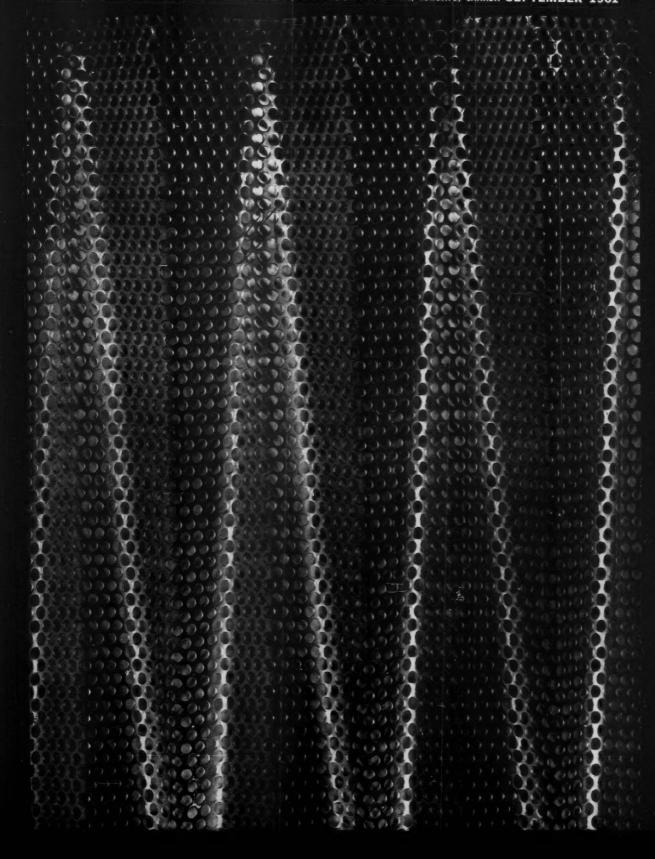
# Design Engineering

FIVE DOLLARS A YEAR PUBLISHED BY THE MACLEAN-HUNTER PUBLISHING COMPANY LIMITED, TORONTO, CANADA SEPTEMBER 1961



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to
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product's
reputation...



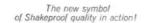














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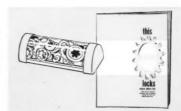
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#### This month's cover

Engineers have long been impressed with the need to combine beauty and utility in their designs. The perforated metal pictured on this month's cover is an example of just such workmanship. We spotted it while on a tour of the Trane Company Limited plant in Etobicoke, Ontario. The actual application is pictured in our article on perforated materials on page 61.

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Fiberglas Reinforced Plastics have the greatest strength-to-weight ratio of any known material. And other remarkable qualities make them one of the most versatile and economical materials for a wide variety of applications . . . in the development of new products . . . to improve present products or processing equipment.

Take this design award winning FRP park bench, a product of Polyfiber Limited. Practically indestructible. Proof against any weather. Permanently gay and colourful. The colours are moulded in.

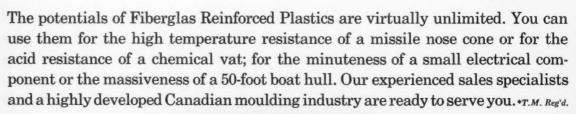


Or this radar dome made of Fiberglas Reinforced Plastic by Long Sault Woodcraft Limited. Light enough for easy transportation over difficult terrain. Strong enough to withstand constant lashing from subarctic gales. Impervious to snow and ice. Weathertight to protect delicate mechanism.

FRP tank trucks are lighter, use less fuel.

Reduce wear and tear on moving parts . . . carry greater live loads at less cost. And they're corrosion resistant. This tank truck was built by Canbar Industrial Plastics Division of Canada Barrels and Kegs Limited in conjunction with Brantford Coach & Body Limited.

The 500 or so Fiberglas Reinforced Plastic parts that go into the de Havilland Caribou are a good example of the way specialized shapes can be produced inexpensively in limited quantities. A strong, lightweight material, of course, is essential.





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#### The contributors



Duffy



Harley



Gwyn



Davies

This month our line-up of contributors is somewhat unusual. They're all regulars, including three whose names appear each issue in the left-hand column of this page.

Frank Davies is the man responsible for the art work and layout of each issue of DE. His position entails art direction over fifteen other Maclean-Hunter publications, but he assures us he pays particular attention to the design of DE because of its special audience.

Frank studied in England, specializing in illustration, processes of printing reproduction and advertising design. But his practical experience has not been confined to any specific field and he has designed almost everything from theatresets to wine bottles. It's his belief that a professional designer should work in as broad a field as his ability will permit.

A member of the National Industrial Design Council's "Design of Merit Award" committee, he is also president of the Art Directors' Club, Toronto and one-time director of an extension course in magazine design at the University of Toronto. In this issue he reports on the Eleventh International Designers' Conference in Aspen, Colorado.

Richard Gwyn regularly reports to DE from the Ottawa scene and has contributed a whole page this issue on Canadian industry's corporate image. As Ottawa correspondent for Maclean-Hunter's business publications he gleans his notes from many tedious hours in the Press Gallery of the House of Commons and from interviews and chats in the offices and hallways of Canada's government leaders. He is no newcomer to the parliamentary beat, having been Ottawa correspondent for Thomson Newspapers prior to joining his new

company just over a year ago. In off-duty summer hours he goes out sailing and fits in some squash and skiing in winter.

Gordon Duffy is Montreal editor for Maclean-Hunter's industrial publications and thus DE's newshound in Ouebec province. This time he's dug out a story on how engineers worked alongside medical men to develop a decompression chamber for expectant mothers. Gord's had a rough and tumble career that started as clean-up boy in a restaurant during school vacations. After a spell in the merchant navy he became a newspaperman in Halifax and covered two of the province's worst mine disasters. In 1959 he was appointed assistant manager of M-H's editorial services department and in 1960 moved to his present position in Montreal.

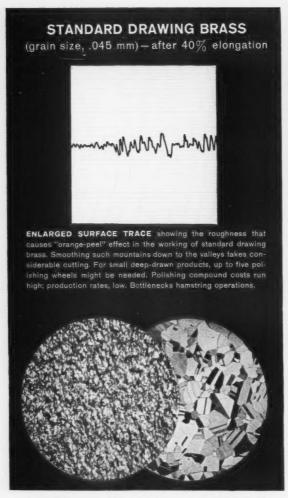
In his spare time Gordon enjoys reading and writing but he likes to get outdoors.

And we felt it was about time you met our cartoonist. His name (in case you can't read the signature on his cartoons) is Harley... Harry G. Harley.

Harry started off to be an engineer, studying aeronautics at the University of Toronto, but says the calculus was more than he could reckon with. So he took up cartooning and sold his first, ten years ago, to Baseball Digest. In 1957 he landed a job as editorial cartoonist with the St. Catharines Standard, doing some free-lance work on the side. But the spare-time work built up well enough for him to go full-time free-lance in January of this year. In fact, he plans on moving soon from his cluttered cellar studio to a brand new one in the home he's building just outside St. Catharines.

## THESE SURFACE TRACES

prove that you can cut polishing costs with Formbrite, Anaconda's superfine-grain drawing brass.



THE STRETCHED SAMPLE of standard drawing brass looks like this (left, above) when seen in oblique illumination and magnified 20x. Its microstructure is shown 75x at right. This is the kind of drawing brass that's been used for decades for stamped or drawn brass products and the micrographs show in another way why polishing costs have been high.

FORMBRITE DRAWING BRASS (grain size, .005 mm) - after 40% elongation ENLARGED SURFACE TRACE showing Formbrite's smoothness even after deformation, the test of polishing characteristics of a drawing brass. It is relatively easy to level these little hills on the surface of Formbrite. In many cases, users find they eliminate cutting operations altogether, need only a simple color buff. Finishing savings run up to 50%.

WHEN SEEN IN OBLIQUE ILLUMINATION and magnified 20x by the microscope, the stretched Formbrite surface looks like this (at left, above). Its microstructure is shown 75x at the right. This uniform superfine-grain structure is produced by special procedures of rolling and annealing.

FORMBRITE is springier, harder, more scratch resistant than the usual drawing brasses in the same standard tempers. Yet it retains remarkable ductility for forming and drawing — even such deep-drawn products as pen barrels. And Formbrite costs no more than ordinary drawing brass, despite its superiority. For fuller details write: Anaconda American Brass Limited, New Toronto, Toronto 14, Ontario. Sales Offices: Quebec City, Montreal, Calgary and Vancouver.

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#### Reports — A world roundup of engineering and design interest

#### Much stronger permanent magnets now commercially available

Discovery of a new process has enabled commercial production of permanent magnets with nominal energy of 7,500,000 gauss-oersteds—about 1 million gauss-oersted above that of any permanent magnet presently available in full-scale continuous production. By achieving 100% grain orientation through the entire cross-section of the magnet casting, straight-line highways are created for the magnetic forces. The magnetic crystals are elongated and the atomic structure aligned in a single pre-determined direction to conform to the ultimate magnetic orientation desired, (See photo. New sample at left.)





The result is the most powerful anisotropic magnet material available. It produces more magnetic energy per unit volume or weight than any of the many variations of aluminium-nickel-cobalt-iron alloys. Its high energy product is surpassed only by that of the expensive platinum-cobalt alloys which are not commercially available. Source: U. S. Magnet & Alloy Corporation.

Circle 300 on Reader Service Card

#### New technique for thinner freezer walls

It should be possible to design thinner walls for domestic refrigerators and freezers using available insulating materials, according to the result of recent laboratory tests.

A research team sat down with the published conductivities of various insulating systems and calculated theoretical minimum wall thicknesses. It then tested specimen walls in outside surface temperatures of 90F and relative humidity of 85%, and inside conditions of 38F and —5F. Thermocouple readings confirmed the mathematical calculations that refrigerator walls could be designed as thin as 1.3 inches with glass fibre (k of .225) or only 1 inch with heavy gas-filled polyurethane foam (k of .15). Freezer walls were possible as thin as 2.4 inches with air-filled glass fibre (k of .21) and 1.7 inches with gas-filled foam (k of .14).

Computations indicated the feasibility of freezer walls as thin as six-tenths of an inch using the fibrous glass supported vacuum insulating system, but costs would be considerable. Source: Owens-Corning Fiberglas Corporation.

#### A computer that sings, and recites Shakespeare

A research team working towards a better understanding of the nature of human speech has taught an electronic computer to reproduce human speech. To demonstrate the ability of their new student the researchers recently attended a scientific meeting in the United States armed with a recorded tape of the computer reciting the soliloquy from Shakespeare's "Hamlet".

Using a high-speed general-purpose computer they programmed it to accept a list of the normal English phonetic symbols on a sequence of punched cards. After digestion it can come up with syntheticized intelligible speech.

Although the result has a slightly mechanical ring, further refinements are being made to the computer program to achieve a more polished result. Eventually it's hoped to be able to imitate the voices of a specific person. But the computer is already capable of singing. In its demonstration debut it reeled off a verse of "Bicycle Built for Two" in a baritone voice. The notes were exactly on pitch. Sources: Bell Telephone Laboratories.

#### Giant storage tank for cryogenic gases

Canada's largest cryogenic vessel is being built at Sault Ste. Marie for storage of hydrogen, oxygen, nitrogen and other gases. Using double wall construction, the 33 ft. diameter sphere of aluminium plate is designed to operate at 15 psig over a temperature range of ambient to minus 297 F. A carbon steel vessel 39 ft diam. by 47 ft of all welde I construction contains the sphere and provides insulation and protection from earthquakes.

Cryogenic storage of gases in liquid form is necessary from an economic stand-point, saving construction and land costs. 117,000 Imperial gallons of liquid oxygen stored in the vessel would occupy only 18,820 cu ft. But if it was stored in a gaseous state at 50 psi, a sphere 200 ft in diameter would be required with a plate 2 in. thick. If stored at atmospheric pressure and a temperature of 60 F the corresponding space occupied would be 15,000,000 cu ft. This would necessitate a containment vessel covering an area of 100 sq. ft and a quarter of a mile high. Source: Horton Steel Works, Limited.

# SUPER-SPEED-SUPER-POWER



This special machine designed and built in the plant of Electro-Mechanical Products Co., clamps and pierces 3 holes in 20,000 pieces per day. It uses 3 Bellows Super-Speed Air Cylinders and a Bellows Air Motor. Set-up cost 1/3 the price of a punch press die.

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#### Propane gas burner generates electricity

A high-temperature generator has been developed for successfully converting heat from a conventional fuel directly into electricity. Called a flame-heated thermionic generator, it burns a mixture of propane and air, like an ordinary camp stove.

The main parts of the generator are a furnace and a thermionic converter comprising two electrodes or metal plates. The flame heats one of the electrodes to 2,800F, causing electrons to boil off and jump a small gap to the cooler electrode, thus producing an electric current.

Although the development model is a small, portable unit, one possible application for bigger flame-heated thermionic generators is improving efficiency of central power station plants. Very high temperature heat from burning gas or oil could pass through the device and be converted directly to electricity. The remaining heat, at lower temperatures, could then be used to produce power in the conventional turbine-generator system. This could possibly boost efficiency by 20%. Source: Atomics International.



#### New material halves cost of tool and die making for plastics

A new metal and plastic compound that may revolutionize tool and die making processes will be on the Canadian market soon. So new that it does not yet have a name, the product is ideal for making low-cost tools used in forming thermosetting plastics. It is to be manufactured as a dry powder, which can be poured into a mold and liquefied by heat. It will cool and harden quickly to the exact shape of the mold.

The material can be formed easily and has an exceptional balance of strength and heat conductivity—the strength of plastic and the heat conductivity of metal. It has higher heat conductivity than other metal-plastic tools now available, and has sufficient strength to operate at high temperatures

Part of the savings in cost will come from the ability of the material to be cast net size with tolerances as close as .001 of an inch, It eliminates machining and hand finishing required for metal dies and the cost will be about half. Source: The Boeing Company.

#### First fluid lathe off production line

The first production model of a liquid lathe for cutting materials has just been demonstrated in California. A machine resembling a cannon, it delivered a needle fine point of liquid under thousands of pounds of pressure to slice through cement, wood and tough plastic.

The liquid cutting concept was developed as part of a research project to find new tools and processes for shaping and forming exotic materials for advanced aerospace craft. An immediate practical market was found in the safe removal of high energy solid propellant materials from engine casings. Models for cutting



and shaping metals and other materials are being developed. Source: Navan Products, Inc. Circle 301 on Reader Service Card

#### Stainless castings stronger at very high temperatures

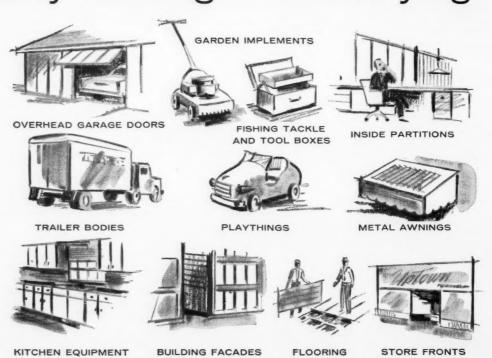
There is experimental evidence that cast alloys serving as high temperature load-carrying components have far greater resistance to deflection than wrought alloy components of equivalent

Experiments conducted at 1,600F confirmed the relationship between grain coarseness and deflection resistance. Specimen bars of type HT cast alloy (35% nickel, 15% chromium) were tested with similar bars of the equivalent wrought alloy (a special high carbon version of type 330, to match the normally high carbon content of the cast alloy). Bending stresses were applied to both continuously over an extended period and the coarse-grained cast alloy specimens exhibited considerably less deflection.

An interesting check was made on the experiment by melting some wrought type 330 alloy and casting it into test bars. These bars, with the new typical cast grain structure, showed far greater resistance to deflection at 1,600F than the original wrought material. Source: Alloy Casting Institute.

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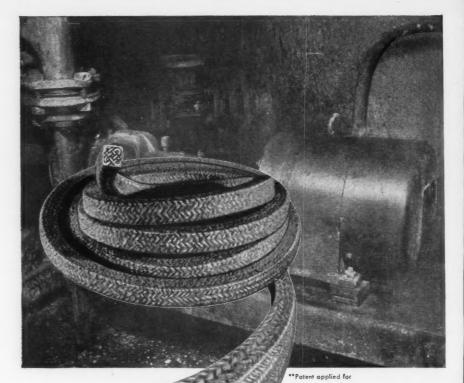
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tages of LATTICE BRAID construction: completely integrated structure for greater strength, longer life, more flexibility and lower maintenance cost. No single outer braid or cover to wear through. Garlock 5875 LATTICE BRAID holds together without disintegrating, wears far beyond ordinary packings.

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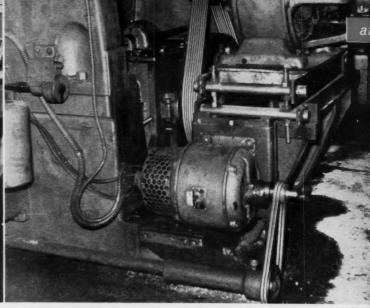
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Gear drive caused chatter marks on parts

Gates High Capacity Drives replace gear and flat belt drives

### **GATES SUPER HC DRIVE** REPLACES GEAR DRIVE IN LIMITED SPACE... ends costly rejects

Chatter marks on parts produced by a vertical boring mill at Manitoba Bridge and Engineering Works, Ltd., in Winnipeg resulted in costly rejects. The cause of the chatter marks was traced to the gear and pinion on the main drive.

About a year ago, the plant engineer investigated the possibility of replacing the gear drive with a flat belt or conventional V-belt drive. However, to do the job, both types of drive had to be too large to fit into the limited space available.

Advised by a Gates Representative, he then designed a Gates Super HC High Capacity Drive for the boring mill. He found that the high capacity Gates Drive was so compact that it could readily transmit the required power in the space vacated by the gears. Now, with the smooth-running Gates Drive, the mill is turning out clean, even cuts, eliminating chatter marks.

The Gates Fieldman located near you is a drive design expert. To contact him for help in designing a new drive, or for quick delivery of replacement V-belts, call your nearby Gates Distributor.



#### Gates Rubber of Canada Ltd. Brantford, Ontario

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Drive costs are reduced as much as 20%. Drive weight is reduced 20% and more. Guards and machine housings can be smaller, shafts shorter. Reduced weight and overhang on bearings cut bearing loads. Moreover, the Gates Super HC Drive can operate at belt speeds up to 6,000 ft/min without dynamic balancing!



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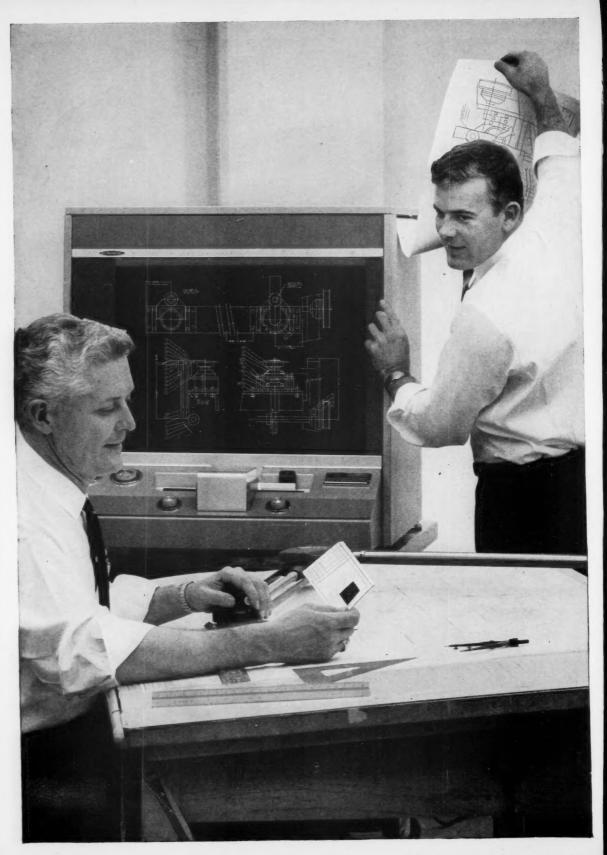
The exclusive construction features of Gates Hi-Power V-Belts-Concave Sides, Precisely-Engineered Arched Top, Flex-Bonded Tensile Membermake them more dependable than ordinary conven-

tional V-belts, giving you far longer belt life on even the toughest applications.

Moreover, because of Gates high standards of quality control, you get a perfectly matched set of Hi-Power V-Belts every time-every belt pulls its share of the load throughout the long service of the drive, further increasing belt life.



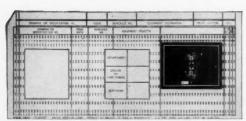
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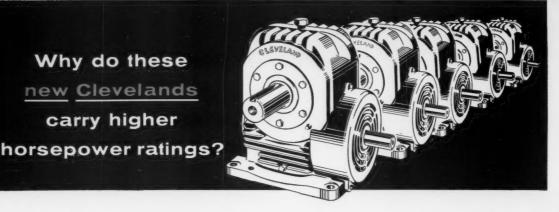
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## Why do these new Clevelands carry higher



It's because Cleveland design engineers - drawing on 47 years of experience - have successfully blended the just right combination of housing design, exclusive heat-treatment for alloy steel worms, centrifugal casting of bronze gear rims together with larger, more rugged taper roller bearings on worm and gear shafts.

This permits substantially higher horsepower ratings with smaller worm and gear units - units that more than meet AGMA's new Standard 440.03. Cleveland now offers speed reducers from one to forty horsepower - at savings of 50% or more on cost per horsepower.



HOUSING is a rugged one-piece design of highest quality cast iron, ribbed for maximum strength and heat dissipation. Cooling fan

of unique design is mounted on input end of worm shaft and is equally efficient in either direction of rotation. Only one gear shaft bearing plate is large enough to permit assembly of the gear. On gear shaft extension side, gear shaft bearing is mounted in the housing bore and backed up by a clamping plate. This gives a stronger housing and provides maximum strength for overhung loads. Housings are designed for mounting in one position only, thus avoiding design compromises necessary with universal mount types.



BEARINGS on both worm and gear shafts are Timken tapered roller bearings, providing adequate thrust

and radial capacity. Worm bearings are mounted directly in housing bore for greater rigidity.



WORMS are cut integral with shaft and accurately ground to a high surface fin-

ish on both thread flanks. Shaft extension diameter is especially large to permit increased overhung load capacity. An exclusive heat-treating technique provides a high degree of hardness throughout the entire thread thickness and well below the worm's root diameter. It gives maximum thread strength and resistance to wear without losing the advantage of a tough core of medium hardness.



GEARS have centrifugally cast bronze rims with a high tin-nickel content. They provide greater density and a

higher hardness, giving increased resistance to wear and fatigue pitting. Bronze rims are centrifugally cast integral with cast iron centers, in smaller sizes up to 6 inches, which permits strong mechanical keying of the two parts - without dependence on actual surface bond. Gear shaft extension diameters are especially large to permit greatly increased overhung load capacity.

ORIGINAL MASTER WORMS for each size and ratio of worm gearing, are made individually in Cleveland's tool room to extremely close tolerances and kept in perpetual stock. Cleveland makes all their hobs. No outside source has been found that can produce worm gear hobs to their exacting tolerances and standards. Each hob is checked against this master worm as are production worms and gears. Thus, it's not necessary to ever replace Cleveland worms and gears in sets. A new gear will operate perfectly with an old worm and vice versa.

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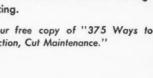


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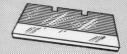
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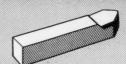
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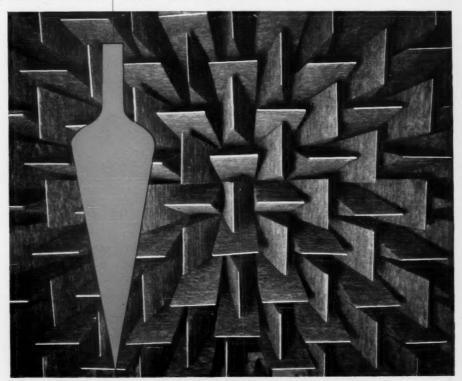
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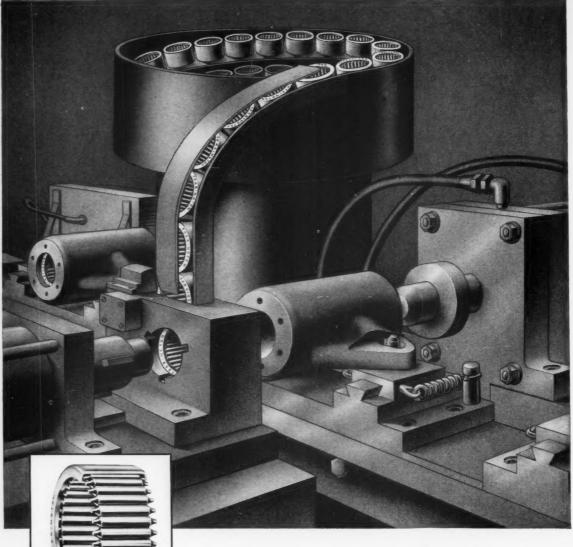
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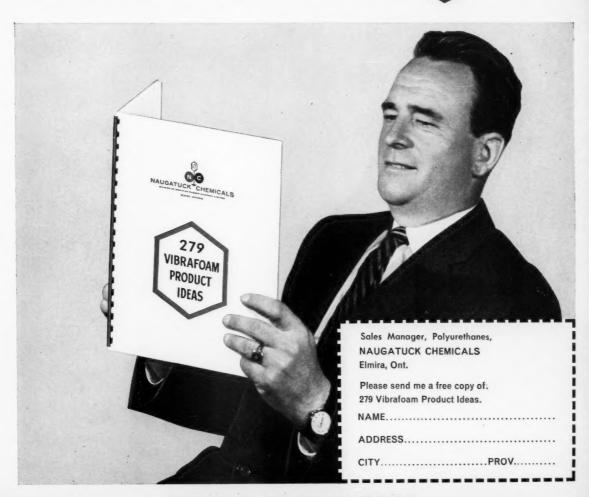
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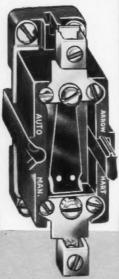
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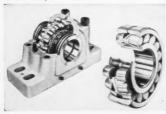
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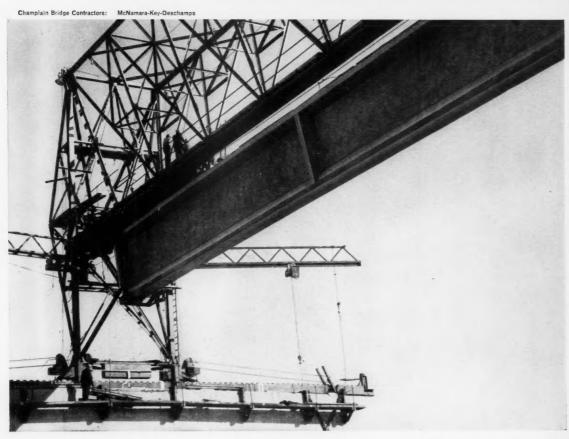
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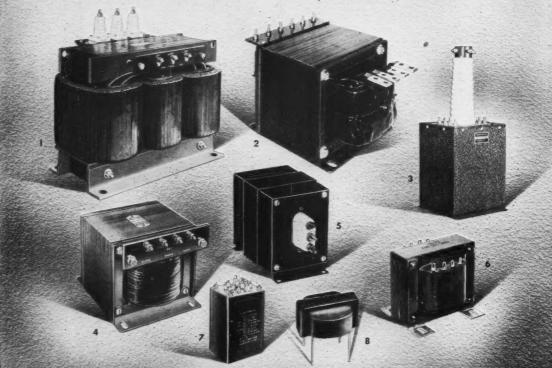
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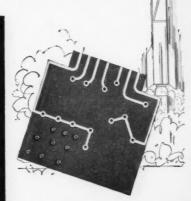
JUST plug it in — United Standardized eyelets hold wires by compression on multi-contact computer part. Tight hold eliminates soldering time and bulk.



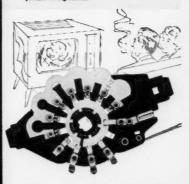
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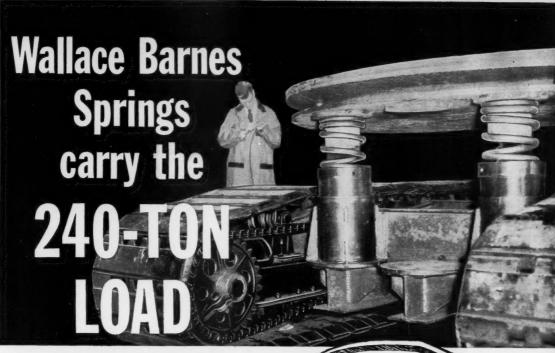


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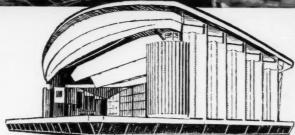
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This is the first stage of its kind in the world and CNE officials are confident that it will pay its way by allowing football and other field activities to take place immediately before and after the annual 3-week Grandstand Show.



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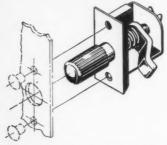
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Design a package that no standard fastener will fit, and you'll need a special device. We design and build specials. But standards (like those shown here) cost less and get there sooner.

56 pages of standard fasteners in our new Handbook No. 11\* Send for one... it's free. Write to your nearest distributor listed below.

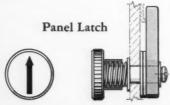
#### Adjustable Fastener



Best Application: To compress a gasket, resist vibration, fit varying frame thicknesses.

Form: One piece latch installed by passing knob through door. Quarter turn opens or closes. No striker required. Features: Further turning of knob changes grip to hold different frame thicknesses, tightens door against gasket.

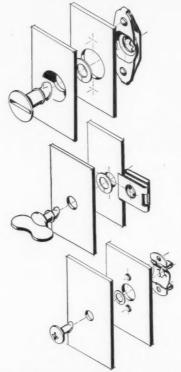
Availability: From stock in 4 sizes, miniature to large. \*Handbook pp. 28-37.



Best Application: Where spring loading, single hole mounting, and minimum inside clearance are factors.

Form: Chromed knob with arrowhead to indicate pawl position. Spring in plated ferrule applies tension to pawl. Features: Uses only 3/6" inside space. Pushing knob relaxes operating tension. Availability: From stock, individually packaged. \*Handbook pg. 43. Other latches, pp. 38-43.

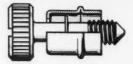
#### Lion 1/4 Turn Fastener



Best Application: For light weight, quick operation, vibration resistance. Tomeet MilSpec. MIL-F-5591A (ASG). Form: Swaged nose stud, retainer (to captivate stud), solid leaf receptacle. Features: Quarter-turn clockwise locks, quarter-turn counterclockwise unlocks. One piece stud design adds considerable strength. Clip-on receptacle speeds installation.

Availability: From stock in variety of head styles. Ten receptacles offered over the three sizes, including sidemount and casting mount. \*Handbook pp. 9-18.

#### Retractable Screw Fastener

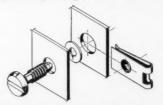


Best Application: Drawers, slides, doors, especially on electronic equipment.

Form: Polished stainless steel screw retained in standoff flanged into door. Screw engages tapped hole in frame. Features: Screws can be used in multiples, operated individually without forcing door. Float of screw in standoff tolerates misalignment.

Availability: From stock in 5 head sizes (slotted or unslotted), 8 thread sizes from ¼-20 to 4-40. Spring loading for automatic retraction also from stock. \*Handbook pp. 18-22.

#### Quick-opening Screw Fastener



Best Application: Where misalignment is present, or where doors may be subject to hard use or deformation.

Form: Heavy square-threaded screw assembly held in outer panel by retainer and engaging receptacle on frame. Features: Maximum float for ease of installation and alignment. One assembly fits variety of door and frame thicknesses.

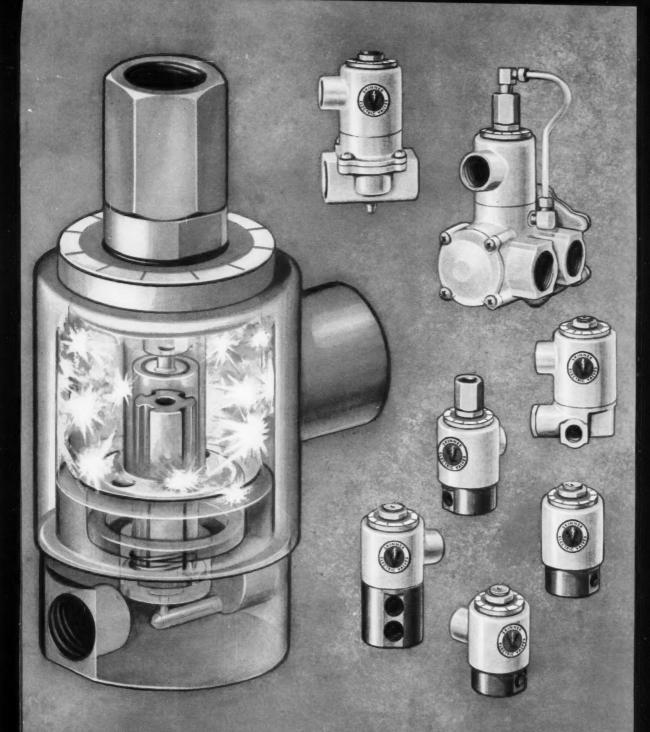
Availability: From stock in Nos. 2 and 7 sizes. Three head styles; riveted, welded, clip-on receptacles. \*Handbook pp. 23-27.

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differential is 5 to 150 PSI.

Three-way XL series valves are available normally closed, normally open and directional control. Orifice sizes are %", %" and %" with corresponding



NPTF pipe connections. Operating pressure differential is 5 to 150 PSI for the  $\frac{1}{2}$ " and  $\frac{3}{4}$ " size and 10 to 150 PSI for the  $\frac{3}{4}$ " size.

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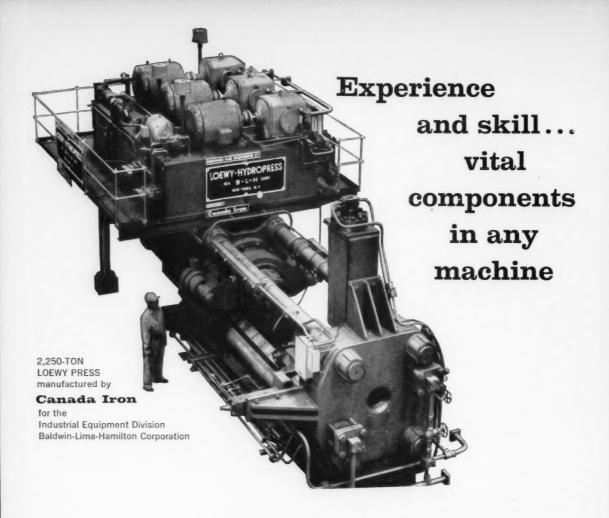
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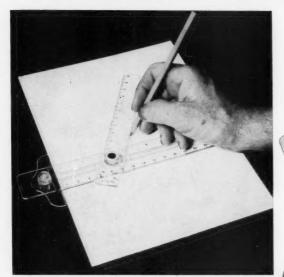
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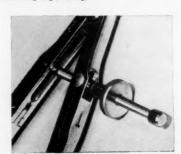
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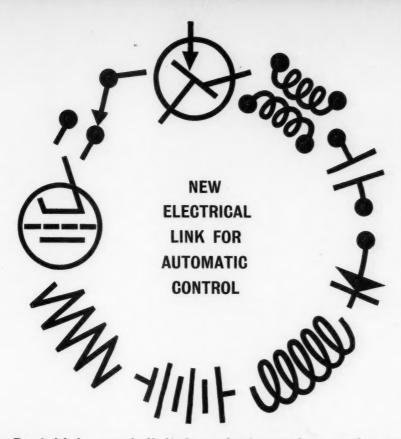
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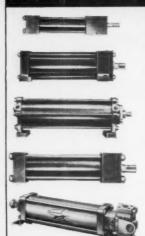
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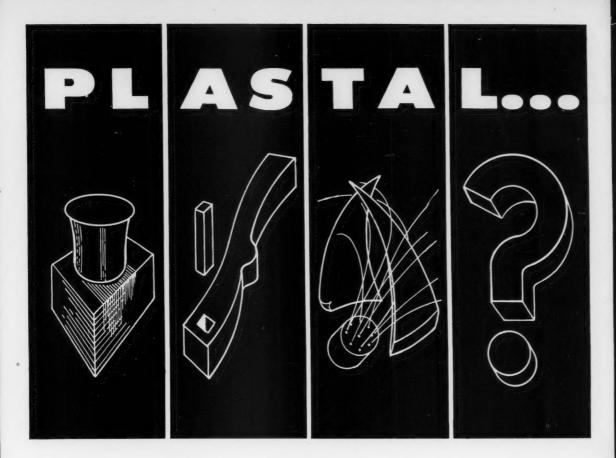
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India and Britain are two countries working to develop new uses for solar energy. At top, experiments are being made with a commercial cooker in New Delhi. Below is a solar cooker on the roof of a London laboratory.

#### **Design Engineering**

September, 1961

### Ancient energy sources may be harnessed for Canada's north

Here's a report that reveals the potential of solar, geothermal and wind energy as agents for present-day applications

What is so new about sources of energy which are billions of years old?

Solar energy? . . . The thermonuclear reactor 864,000 miles in diameter which we call the sun has been generating energy since before our planet came into existence.

Wind energy? . . . The winds ruffled the hair of our primeval ancestors.

**Geothermal energy?** . . . The kettles in the earth's crust have been on the boil since before life began.

There has been much clamor about the advances in the release of energy by artificial means from the nucleus of the atom. Prospects are held out, though not yet filled, of reproducing on earth the very processes by which the sun itself generates its energy. The promise is that the atomic process will provide energy a million times greater than that from the fossil fuels we call coal and oil. It would even seem that in manmade nuclear reactors all the needy countries of the world might find the energy without which there can be no real prosperity and material well-being for their needles.

One day this might be the case . . . but even the wealthy and technologically advanced countries are finding it hard and expensive to get the right answers. In the absence of small-scale and not-too-expensive atomic reactors, countries which are in need of energy must find alternative sources.

#### Muscle energy is expensive

Most of the backward countries depend, even today, on muscle power. But muscle power is the most expensive energy in the world, and paradoxically, it is all the poorest can afford.



An array of solar cells mounted on face of Tiros III capture sun's rays to provide electrical energy for the U. S. weather satellite.

A typical scene in a tropical country is that of a bullock team raising water from a well. To the chanting of the drivers, sweltering in the sun, the animals trudge backward and forward, or round and round, lowering buckets into the well, hoisting them and tipping the water into a distribution system.

The energy equivalent which this team produces costs as much as 20 times that produced by conventional electrical sources. An industrial worker in a highly developed country can with the flick of a switch command the equivalent effort of a hundred human slaves. No wonder then that much research is being made into alternative sources of energy.

#### Solar devices are getting cheaper

Solar devices cover a wide range of applications, from producing heat equalling that of the fireball of an atomic bomb to producing ice by refrigeration. Since earliest days men have contrived to focus the sun's rays to obtain intense heat.

A great deal of ingenuity has in recent years gone into the methods of trapping the sun's rays and utilizing them. Two big solar advances of recent years derive from desert research and space research.

The first is a "solar pool," which has excited eminent scientists visiting Israel. To capture enough sun to provide energy on a scale big enough to run a power plant would require an expanse of several square miles of expensive mirrors, which are the conventional medium used in most solar methods. However, experiments being conducted near the Dead Sea suggest ways in which waste water could be used instead.

The principle is based on a natural phenomenon discovered in a lake in Hungary where the bottom waters were found to be warmer than the top layers. The explanation was a difference in density. Adapting this, Israeli engineers have used heavy brine for the bottom waters and not-so-salty waters on the top.

The pond is shallow and the bottom black . . . since black attracts heat. The bottom waters get hotter and hotter, while the top waters act as a transparent lid to retain the heat. In a shallow pond, the heat could be transferred to generate electricity.

The second is a "solar battery." This consists of wafers of silicon, which activated by the sun, spontaneously release electricity. The Vanguard satellite of the U. S. has been in orbit since March 1958 with its radio transmitters powered by such solar batteries.

Such semiconductors, made from crystals, are not cheap to manufacture. The wafers cannot be large, and coupling them together increases liability of subsequent failure. But big advances have been made . . . subsidized mainly as a result of space research . . . and today there are devices which use plastics embodying the necessary elements and capable of being made into large-scale sun-traps.

#### Harnessing the wind

As there are no winds in space, research in the field of wind energy has not had the fillip which solar energy has received through space research programs.

The use of wind as a power supply is certainly not new. For example, Denmark turned to windmills for electric power during two world wars, when imported fuel became scarce. The Netherlands, beleaguered by the sea, has used windmills for pump-drainage. Britain, when faced with local and national fuel shortages, built windmills as power suppliers around its windy coast.

In Antarctica, when it costs a gallon of aviation fuel to fly in two gallons of diesel oil, a windmill to maintain radio communication is certainly economic.

While power rich countries have neglected this natural source of free energy, countries lacking other sources can use the wind to real advantage. Harnessing the wind to produce power takes three forms. These call for small units suitable for a family or a single farm; medium-sized units adequate for a village or a collective farm; or big units to save fuel in an existing network of conventional generating stations.

Wind is free. It delivers itself to the power station. It is inexhaustible. But it is intermittent. Even in the windiest places on earth, there is no certainty of wind at any given time. It is this inconsistency for which the scientists and engineers are attempting to find a solution.

A wind plant to generate electricity can be set up in the remotest places, given a windy site. It does not need much maintenance, and it can be left to run itself. If it is a question of pumping water, the mill can do that directly and the water, if need be, stored.

Paul la Cour, a science teacher in Denmark, used the wind to generate electricity which he passed through a solution of sodium hydroxide, and by electrolysis, separated the hydrogen and oxygen gases. For many years before the beginning of the century, the classrooms of this teacher were illuminated by the dazzling white light produced by impinging an oxyhydrogen flame on a zirconium cylinder.

Modern interest centres on similar ideas. Hydrogen and oxygen are separated and stored, to be recombined in a battery of hydrogen-oxygen cells. These cells release electricity on command of the proper controls. Electrolyzers have been brought to a high state of development, and this means that electricity generated by intermittent winds can be used later as a reliable power source.

That windmills are not an entirely unrecognized source of energy, even in this highly technical age, is illustrated by the fact that the Government of India has given instructions for the erection of 200 wind machines this year. Such developments will provide new means of pumping water for irrigation, but it should also introduce electricity into some of the distant villages which now have none. This electricity will provide heat for cooking, light for study, and power for radios with which to keep abreast of events in the world. Thus something as simple as a windmill can revolutionize the life of a remote village.

#### Hot springs put to work

According to legend, the bobbing lid of a kettle inspired James Watt to invent the steam engine, the trigger that set off the first industrial revolution. While this legend is not exactly true, it does point up another source of power.

Although some of the earth's "kettles" have been boiling and bubbling since long before life existed on this planet, their potential as a source of energy has been recognized only in recent years. Now they are being rated with cataracts and dams as a cheap source of electric power.

For instance, Iceland has 13 natural steam fields and hundreds of active springs of lower temperature. These can be harnessed as and when required. Already these natural sources heat the homes of 46,000 persons and help to feed the nation from over 100,000 square yards of greenhouse. It is said that there are over 500,000 kilowatts of electricity which could be made available in this northern land.

The harnessing of power in New Zealand's North Island has altered the pattern of power generation in that land. Their power plant has been in operation since November, 1958. It supplies an eighth of the total of power energy production in that island. Plans are already under way for extending the scheme to a total of 282,000 kilowatts. The cost of production is less than one cent per kilowatt-hour.

Many of the potential sources of heat are not visible on the surface. They must be prospected for underground, just as precious minerals. Seismic soundings, gravimeters, magnetometers and airborne instruments can discover the likely formations in which heat sources may exist.

There are ingenious ways of establishing the temperature of deep-seated base rocks. Since electrical resistance of rocks decreases with increasing temperature, a "thermistor," or semi-conductor resistance thermometer, can be lowered into a borehole and will signal back the precise temperature. Natural and manmade isotopes are used in heat prospecting.

The deeper one goes into the earth's crust, the higher the temperature. The radioactivity of the rocks spontaneously generates heat. Water coming in contact with the rocks is heated . . . and is available as another source of energy. But is the supply limited? How long can this go on? No one knows the full answer, but there seems to be no diminishing of the supply at the present time.

Geothermal energy is cheap. Operating costs are low. For instance, an installation in California with



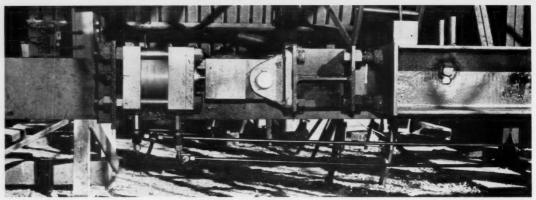
At India's National Physical Laboratory a multi mirror system concentrates the sun's rays to help drive a model water pump.

a capacity of 12,500 kilowatts runs for 24 hours a day, and for 16 hours of that it is entirely automatic. Plants near Pisa have been operating for years without problem. They produce all the electricity required to operate the entire Italian railway system. The biggest single plant has a capacity of 100,000 kilowatts, and has been running constantly for 10 years with a load factor of 99 percent. The cost per kilowatt-hour is 2.5 mills, which is about one-half the most optimistic bids of the atomic engineers.

#### The challenge to Canadians

These then, are three basic potential sources of energy . . . the sun, the winds and the earth's core. Design engineers around the world are watching with extreme interest the developments bringing these sources nearer to full-scale application. Canadians, of course, are vitally interested. The need for cheap, reliable sources of power in our vast northland is an everpresent challenge to the engineer. Some consideration has been given to the use of small-scale nuclear stations, but there are very good reasons why they have not been adopted for this area up till now.

Some work is being done on this problem of power needs at the research group level (NRC, for instance) but generally speaking, the engineering fraternity is not concerned enough with the subject. The sun and the wind are certainly available up there, and possibly even heat sources in the earth's interior. The raw materials are handy—all that is needed is the engineering. Looks like an interesting challenge for some individual or group of engineers.



Hydraulic cylinder horizontally deflects prototype panels to simulate movement of building.



Other cylinders deflect panels vertically, completing check on wind and thermal expansion.

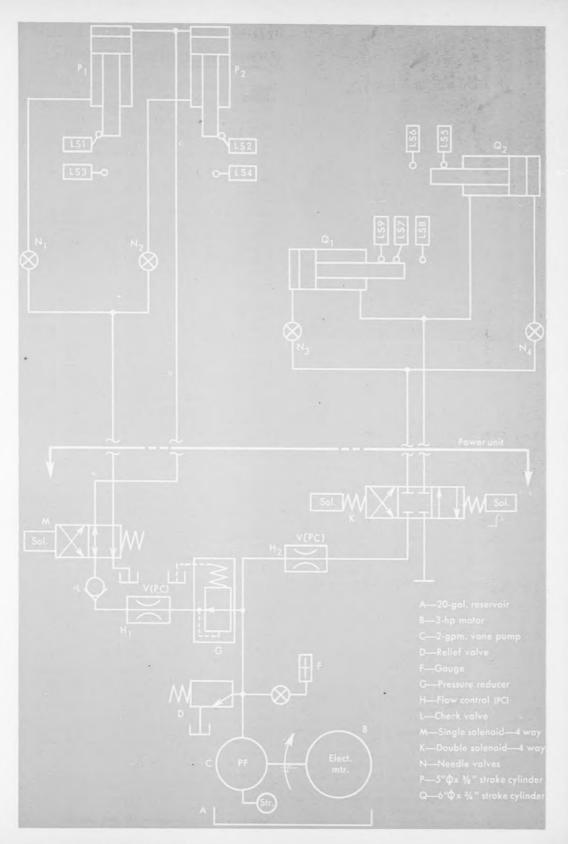
#### Hydraulic unit tests structural panels

A test assembly, specially designed and built in Canada checks water leakage at sealing joints in curtainwall panels

Four hydraulic cylinders and a special electro-hydraulic power unit built by Vickers-Sperry of Canada, Ltd., Toronto, provide the muscle to "move a building" in a test rig designed for evaluating curtain wall structural panels. The hydraulic cylinders deflect the prototype panels horizontally and vertically to simulate movement of both the building and panels caused by high velocity winds and thermal expansion. The test facility, built by The Warnock Hersey Company, Ltd., Toronto, is used for checking water leakage at panel sealing joints.

Curtain wall panels mounted on the test rig are blasted by winds up to 150 mph created by an aircraft engine propeller. Water is injected into the windstream from tubular rings located behind the engine. Wind velocity and water flow rate can be varied to duplicate a wide range of exposure conditions.

A complete test assembly consists of a block of four panels. Two hydraulic cylinders lower and raise the two upper panels to simulate expansion and contraction caused by variations in temperature acting upon the panels. The steel framework which houses all four panels is deflected horizontally in opposite directions by the other two cylinders located at diagonally opposite corners. This motion simulates building sway.





150 mph winds from aircraft engine blast curtainwall panels installed in test rig.

Cycle and amount of deflection are controlled by limit switches. Total vertical deflection is .118 inch, and total horizontal deflection at each of the two diagonally opposite corners is 3/8 inch (3/16 inch each side of centre). The problem confronting Vickers-Sperry engineers was to design and build hydraulic and electrical circuits which would properly cycle and control

the specified amount of deflection.

The complete vertical deflection cycle (lower .118 inch, raise .118 inch) takes approximately 20 seconds. Cycle time is adjustable by means of a single pressurecompensated flow control valve. Stroking of the two vertical deflection cylinders is synchronized by individual needle flow control valves on each cylinder. The first cylinder to reach the lowest position and trip its limit switch initiates reversal of both cylinders. Both cylinders, however, must reach the top position before the next cycle will start. Thus, the cylinders are resynchronized at the end of each complete cycle.

The complete horizontal deflection cycle (advance 3/16 inch, retract 3/8 inch, advance 3/16 inch) takes approximately 30 seconds. Flow controls for cylinder reversal and synchronization are applied in the same manner as on the vertical deflection cylinders. The pistons of both horizontal cylinders are initially centred with the panel assembly hanging in a true vertical position. A single limit switch stops the pistons at the centre or true vertical position at the completion of

each cycle.

The hydraulic power unit, electrical panel and cylinders were specially designed, built and installed to meet the specific cycling and panel deflection requirements of the test facility. Actual operating hydraulic pressures range from 800 to 1,000 psi. Duration of the test period on prototype curtain wall panels is 5 hours, with continuous cycling.

#### How well do you know your stainless steel?

Here's a challenge to see what you remember of the characteristics of stainless steel. It is one of a series designed to refresh your memory on some of the most important engineering materials.

The following questions and answers were supplied by John B. Burk of the metallurgical service department

of Atlas Steels Limited, Welland, Ontario.

#### **Question 1**

Are all stainless steels non-magnetic?

#### **Question 2**

What elements are added to stainless steel to make them free machining?

#### **Question 3**

What is the maximum hardness that can be obtained from a stainless steel?

#### **Question 4**

How does the ultimate tensile strength of cold rolled stainless sheet or strip compare to plain carbon cold rolled sheet or strip?

#### **Question 5**

Galvanic corrosion occurs when aluminum and stainless are in contact in an aqueous solution. Which metal will corrode under these circumstances?

#### Question 6

What is a #4 finish as applied to stainless sheet?

Which stainless is commonly used for automotive trim?

#### **Question 8**

The machinability rating of AISI B-1112 is rated at 100. What is the rating of stainless type 303?

Is a 16-gauge stainless sheet the same nominal thickness as a sheet of mild steel?

#### **Question 10**

Are brass and copper heavier than stainless steel?

#### Question 11

Can square and socket head screws be made from stainless steel?

#### Question 12

In blanking and punching operations involving stainless, more power is required than for similar thicknesses of low carbon steel. What is the percentage increase?

#### Question 13

What grades should be used for large components where extensive welding is involved and post annealing is impracticable?

#### Question 14

How much does stainless steel expand and contract with heat and cold?

Now turn to page 69 and check your answers,



Dr. Margrete Schweda models as patient while Dr. R. A. McKeown, Nurse Margaret Howard and Dr. Louis J. Quinn test decompression chamber.

#### **Engineers help solve a medical problem**

Engineers and medical men worked side by side in the development of a maternity decompression chamber to ease the pains of child-birth

**Gordon Duffy** 

Montreal editor

A design profile

Future Canadian mothers are sure to be thankful for the efforts of a research team at St. Mary's Hospital, Montreal, in developing what is perhaps the most advanced mechanical aid for easing the burden of child-birth. The team, four engineers from Canadair Limited and four physicians, has come up with an abdominal decompression chamber prototype which will simply accomplish what Dr. Grantly Dick-Read set out to do with six months of pre-conditioning exercises in his book "Childbirth Without Fear".

Main force behind the device is a household vacuum cleaner which is coupled to a thermo-plastic dome to reduce the pressure on the abdominal wall of the mother-to-be. By helping her muscles to relax and

distend during the first stage of labor, she can expect a considerably faster, and much less painful, period of child-birth.

The development was initiated by four physicians at St. Mary's Hospital to improve on the initial decompression suit developed by Dr. O. S. Heyns of South Africa and used by Queen Elizabeth during the birth of Prince Andrew. They started work two years ago and, on directions from Dr. Heyns, built the first suit. This was modified twice but, although the principle was sound, the method had many disadvantages, With only a \$50 grant and no technical help, they were stymied.

It was then that Dr. Quinn, medical director of Canadair, discussed the matter with senior officials of



Members of the development team study the dome which was forced, by hand, from rigid, flexible versalite thermoplastic.

the firm. A decision was made to underwrite the development costs and four company engineers were assigned to work with the medical team on the project. They were: R. J. Higman, P.Eng., director of Canadair's missiles and systems division; Ian Gray, P.Eng., chief test engineer; Gordon Lloyd, leader of the laboratory services group; and Kenneth Cole, P.Eng., group leader in mechanical design.

First of the two prototypes was placed in service at St. Mary's in spring 1960 and another improved model replaced it late last year. The latter is being used regularly and so far the medical staff has a file of 31 fully documented typical cases upon which to base preliminary observations.

#### Increased efficiency

"Added to the relief from pain is the fact that, to date at least, both the length and efficiency of the contractions have shown marked increases," says one of the physicians, Dr. McKeown. "This has meant a corresponding decrease in the length of the labor period."

All of the parts, except the vacuum cleaner, were formed by hand from several types of plastic, steel and aluminum. The dome was forced from versalite thermoplastic that combines rigidity with flexibility. Because of the partial vacuum (to 90 mm of mercury below atmospheric pressure) it had to be rigid enough to withstand the pressure and laterally flexible enough to fit patients of different sizes. However versalite may be replaced by bakelite if the unit goes into volume production, because of similar properties and a much lower price.

#### Comfort is the aim

The dome is made so it can be used on a regular hospital bed, with the patient at an angle of 55 degrees. A rigid black anodized aluminum backboard, padded with sponge rubber covered with fibrethin (fibreglass cloth), extends under the patient from shoulders to hips.

The inside of the dome is lined with unicellular foam rubber. This is continued along the sides and provides a seal along the patient's flanks. The ends, which fit snugly across the hips and lower chest, are also shaped from foam rubber so they complete the four sides of the seal. They are semi-detached from the rest of the dome to provide adjustment for patients of varying body heights. Vacuum is maintained by

attaching these foam end pieces to the dome by vinyl coated nylon elastic.

The dome is constructed with slotted teeth around each end so that the nylon elastic is not sucked into it, and so lateral adjustment for size is still possible. It weighs about 10 pounds and, with vacuum applied, increases to 24 pounds. Four supporting steel pins keep the weight of the dome, particularly when under vacuum, from pressing down on the patient. These pins, eccentrically shaped for quick release, fit into specially designed yokes so that the axis of the dome runs parallel with the axis of the body.

The dome is first applied to the patient's body while she is standing and is held by a nylon web harness fitted with miniature aircraft-type quick release fastenings. When she lies on the backboard the pins are used to adjust the dome for height and lateral spread. The harness is then released.

Once fitted, the patient can still be easily attended by the physician. For abdominal examinations, a quarter-inch thick acrylic window has been included. This is held in place on a foam rubber gasket by a specially designed fastening developed from window cord. The absence of hinges makes sterilization easier.

#### It's self-operating

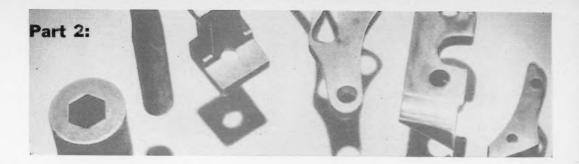
Perhaps the outstanding feature from the patient's point of view is that she operates it herself. There is a vacuum gauge in front of her and when she feels a contraction coming on, she switches on the vacuum cleaner and regulates the vacuum with an air intake valve. Once the contraction has passed, she opens the air intake completely and allows the pressure within the dome to return to normal.

Development of the unit was far from an easy task. Dr. McKeown started with directions contained in letters from Dr. Heyns. A plastics manufacturer, Plastic Garments Limited, made a vinyl suit that enclosed the patient from toes to neck, and the physicians fashioned a framework from hardware store purchases to keep the suit away from the patient's body. This was later shortened to extend only to the upper thigh but, while the idea was sound, it also proved impractical. For instance, every time the physician wanted to examine the patient he had to remove most of the suit. Also, fluid discharges were held within the suit and were both unpleasant and uncomfortable for the patient.

When Canadair engineers were called in, they came up with the new design after hours of discussion with the physicians. But the final design took many months of trial and error. Big difficulty was that nearly all the information about patients' reactions, comfort and other problems had to come second-hand from the physicians. It was not something they could test in the shop, nor see in action to make necessary adjustments.

However there were still some things they could do themselves. Despite a proper seal at one stage, they found they were losing vacuum at an alarming rate. Solution came when Dr. McKeown donned the device and emersed himself in a hydro-therapy tank. They found the foam was porous and so had it covered with fibrethin.

Another problem was the method of getting the required vacuum. An industrial vacuum pump proved quite unwieldy and a nurse brought along her own vacuum cleaner to try it out. The result was satisfactory, and after certain modifications is now giving the best performance.



#### Design clues for investment casting

Concluding a summary of techniques outlined by the Investment Casting Institute and reported by A. A. Knapp of the Canadian Copper & Brass Development Association

In Part 1 of this series (August, 1961) we discussed a little of the history of the investment casting process, the advantages and disadvantages of using it, and then covered in some detail the process itself. The last few paragraphs were given over to a number of the design parameters which must be observed by engineers in their work in this field. Now let's go on with the remaining design guides.

#### Straightness tolerances

The tolerances on straightness are dependent upon the degree of mechanical straightening that can be performed on the part, and they can vary to almost any degree desired. The practical production tolerances for a typical round shaft are shown in Table II.

Table II—Straighteners tolerance for investment casting.

	F.I.R.	F.I.R.
Length	as cast	functional
2" long or less	$\pm.010$	±.005
2"-4" long	$\pm .015$	$\pm .010$
4"-6" long	$\pm .020$	±.010
over 6" long	$\pm.030$	±.015

Length rather than diameter is the determining factor in the size range normally encompassed by investment cast parts.

FIR = full indicator reading.

#### Flatness tolerances

As in the case of straightness, flatness limits are largely a result of mechanical straightening of the part, and length is the determining factor rather than width or thickness. The tolerances shown in Table III

Table III — Flatness tolerances applicable to investment castine.

Length	F.I.K. as cast	F.I.K. functional
1"	±.008	±.004
2"	$\pm .016$	$\pm .006$
4"	$\pm .045$	±.010
6"	±.030	±.015

apply to any flat shape regardless of configuration. These tolerances apply to bow only and do not apply to local surface irregularities. A straight edge and feeler gauges should be used in checking these dimensions.

#### **Concentricity tolerances**

The concentric relationship between outside and inside diameter can only be mechanically controlled where the wall thickness of the part is thin enough to permit movement of the material during the straightening operation. Difficulty is encountered when small diameters with heavy wall are to be straightened, as is shown in the table below. However, the part will become more workable regardless of the wall thickness as the outside diameter increases.

Table IV — Concentricity tolerances applicable to investment castings

Outside diameter	Inside diameter	F.I.R. as cast	F.I.R. functional
3/4 "	1/4 "	.004	.004
1"	1/2 "	.005	.005
11/2"	3/4 "	.008	.005
2"	1"	.010	.008

The straightness tolerance factors may be used where concentric measurements are taken some distance from each other. An average expected runout can be established by applying the distance between points measurement to this charge.

#### Roundness tolerances

a) Solid Bars — In this case, roundness is a factor of the normal shrinkage variations within the metal. It can be seen from Table V that as the shrinkage variation increases with the diameter, the tolerance required increases almost proportionally. In general, ±.005 inches per inch can be used for diametrical tolerances, but smaller tolerances are possible. OD grinding operations are not considered applicable in this case. The "as cast" measurements are considered as the minimum possible tolerances.

Table V — Roundness tolerances for solid bars.

	Roundness	
Diameter	tolerance	
1/2 "	±.005	
1"	$\pm .008$	
11/2"	±.012	
2"	±.015	

b) Hollow Tubing — Corrections can be made on large diameter by straightening operations, and closer tolerances therefore can be held than with solid bars. As can be seen in Table VI, wall thickness is the controlling factor.

Table VI - Roundness tolerances for hollow tubing.

Outside	Roundness	Roundness
diameter	as cast (F.I.R.)	functional (F.I.R.)
1/2 "	±.005	±.005
1"	±.010	$\pm .006$
11/2"	$\pm .012$	$\pm .008$
2"	±.015	±.010

c) Inside Diameter — Tolerances for holes can be set up by using the general scale in Table VII.

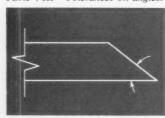
Table VII - Roundness tolerances for holes.

	Roundness
Diameter	within
.092250	$\pm .006$
.251500	±.008
.501-1.000	±.010
1,000 and over	±.010 in./in.

#### Tolerances on angles

The permissable tolerances on angles depends primarily on the nature of the angle, and the circumstances under which the measurements are taken. The accompanying illustrations can be used as a guide.

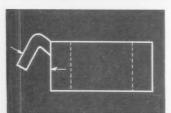
Table VIII—Tolerances on angles.



#### Tolerance

As cast	±1/2°
Functional	±1/2°

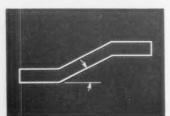
Grinding the angle into tolerance is the only possible corrective measure



#### **Tolerance**

As cast ½° Functional ½°

Distortion in the as cast condition again could be corrected to reduce the functional

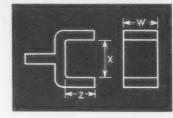


#### Tolerance

As cast	2°
Functional	1°

Distortion in the as cast condition can be corrected to reduce the functional

Table IX-Tolerances on parallel sections.



W	X
1/16	1/16
1/4	3/32
3/8	1/8
1/2	3/16

Values shown are the minimum dimensions which can be cast. Further sizes can be e s t a b l i s hed by proportion.

#### **Tolerances on length**

In general, ±.005 inch per inch is considered to be the acceptable tolerance in the case of length. Consultation with a reputable casting source is advisable however, because of the additional effect of factors such as configuration, cored holes, etc.

#### Parallel section tolerances

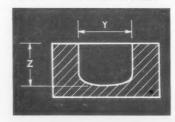
Parts which have parallel prongs supported only at one end require special attention. There are several factors to be considered. For example, consider the typical yoke shown. There is a definite relationship between W and X: as W increases the minimum size for X also increases, because of the added difficulty in working the investment into the X gaps as W grows larger.

Values of Z and W have very little effect on the functional tolerances for the varying range of dimension X, and therefore the table below will provide all the basic tolerances required.

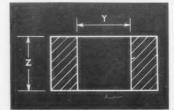
Table X — Tolerances on parallel sections,

Dimension X	As cast	Functiona
1/16"	$\pm .003$	$\pm .003$
1/8"	$\pm .003$	$\pm .003$
1/4"	$\pm .003$	$\pm .003$
1/2"	$\pm .005$	$\pm .004$
3/4"	$\pm .006$	$\pm .004$
1"	$\pm .007$	$\pm .005$
1 1/2"	$\pm .010$	$\pm .007$

Table XI—Tolerances on cores.



Blind	cores
Z	Y
1/4	3/16
1/2	1/4
3/4	1/2
1	5/8
11/4	3/4
11/2	3/4
2	1
21/2	1



Through	cores
1/4	3/32
1/2	1/8
3/4	3/16
1	1/4
11/4	5/16
11/2	3/8
2	7/16
21/2	1/2

#### Tolerances for cores

#### a) General dimensions

See the accompanying diagram. Here Y represents the general minimum diameter in relation to Z. Smaller holes can be cast by using special techniques, resulting in higher costs. No core draft is required for holes less than 1¼ diameter. A core draft of 15° is preferred in holes over this size.

#### b) Minimum wall thickness

Length and cross section of the part are the determining factors for wall thickness. Also, the flowability of the metal being cast will determine the minimum castable wall thickness.

Table XII—Minimum wall thickness in investment castings for different materials,

Material	Min
ASTM B143, Tin bronze and leaded tin bronze	.040
ASTM B144, High leaded tin bronze	.050
ASTM B145, Leaded red brass	.040
ASTM B146, Leaded yellow brass	.060
ASTM B147, Yellow brass, leaded and high	
strength	.050
ASTM B148, Aluminum bronze	.060
ASTM B149, Leaded nickel brass and bronze .	.060
ASTM B198, Silicon aluminum bronze	.050
Beryllium Copper	.040

#### c) Positioning of holes or bosses

Tolerances for determining true positioning of holes or bosses will vary with the controlling diameter.

Table XIII-Tolerance on hole or boss position

AIII Tolerance on n	oit or boss position
Reference	
diameter	Tolerance
1/2 "	$\pm .005$
1"	$\pm .005$
11/2"	$\pm .009$
2"	$\pm .010$
21/2"	$\pm .015$
5"	$\pm .025$
8"	$\pm .040$
10"	+ 050

#### d) Tapered and angular holes

Tapered holes require a general tolerance of  $\pm 30^{\circ}$  on any hole up to  $1\frac{1}{2}$  inch in depth and  $\pm 45^{\circ}$  on holes exceeding this depth. For angular cored holes, a tolerance of  $30^{\circ}$  is desirable on holes up to 1 inch in length, and  $45^{\circ}$  on holes over 1 inch in length.

#### e) Curved passages (cast elbows)

Minimum diameters of curved passages can be established from the section on general hole diameters. Cores should meet at a sharp corner rather than a radius because of the problem of core retraction.

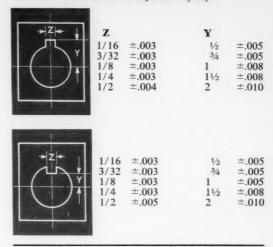
#### f) Rectangular holes

For rectangular holes,  $\pm .005$  inch per inch tolerance should be applied to the linear measurements of the hole.

#### g) Inside keys and keyways

It is recommended that both keys and keyways be omitted from the casting, because they can be machined more economically. If it is desired to cast these areas however, there are definite guides to tolerances. A small

Table XIV-Tolerances on keys and keyways



radius should be incorporated between the inside diameter and the key to ensure good quality in the casting.

#### h) Threads

Threads can usually be machined on a part more economically than they can be cast by the investment process, therefore it is recommended not to incorporate a cast thread in any part.

#### Shrinkage and methods of compensation

There are four types of dimensional changes for the precision caster to consider. For example, consider the following:

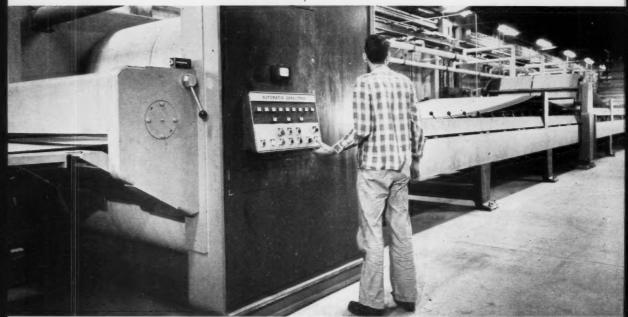
Shrinkage of the wax pattern — Shrinkage of the metal casting —	-1.0% -1.8%	-2.8%
Expansion of the investment during setting	0.3%	
Expansion of the investment during heating	1.0%	1.3%
Net Shrinkage		-1.5%

The pattern die must therefore be made 1.5% larger than desired to compensate for the net shrinkage of 1.5%. These values will be different for most alloys, and a reputable casting source should therefore be consulted.

#### **Dimensions of drawings**

A blueprint for a part to be made by ordinary procedures in a machine shop is not sufficient for the precision caster. It is necessary to indicate the permissible tolerances on all surfaces. For example: "drill 21 drill" is not explicit enough. Rather, the specification should be given in exact decimals with permissible tolerances added. The investment caster can then make a suitable pattern, allowing for the possibility of some secondary machining operation where economy and accuracy dictate.

In conclusion, it must be re-emphasized that designing for production by the investment casting process should present no greater problem than designing for any other casting process. The tolerances and other guides indicated in this article should be used as guides only. For best results, we recommend that you consult a reputable casting source whenever you are considering use of investment castings.



Control panel for the automatic system is located at main belt pull roll stand. Indicator lights record completion of each step.

#### **Automating the paperboard industry**

Automatic sequential changing economizes the production of short run orders on a new corrugated paperboard machine

A long step toward complete automation in the paperboard industry has resulted from development of an automatic sequential order changing system by a Brooklyn, N.Y., firm. In an industry dominated by short run orders, this machine provides quick, automatic changeover and maximum utilization of corrugated paperboard production.

Designed by S & S Corrugated Paperboard Machinery Co., Inc. as an integral part of its new "700" Corrubiner, the system makes possible rapid changeover from order to order in the machine's final operation of scoring, slitting, and cutting, without shutting down the machine, and with only a momentary slowdown of high speed production flow. The entire order change cycle takes only 32 seconds.

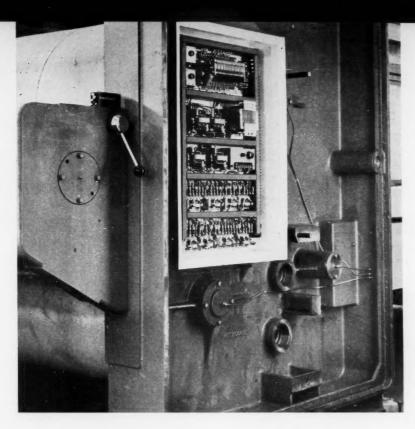
#### Time delay eliminated

Sequential automatic order changing is a step-controlled rather than a time-controlled sequencing that automatically takes full advantage of optimum time for each stage of order changeover. As each step is completed, the next one is automatically actuated and there is no built-in time delay to slow the changeover cycle.

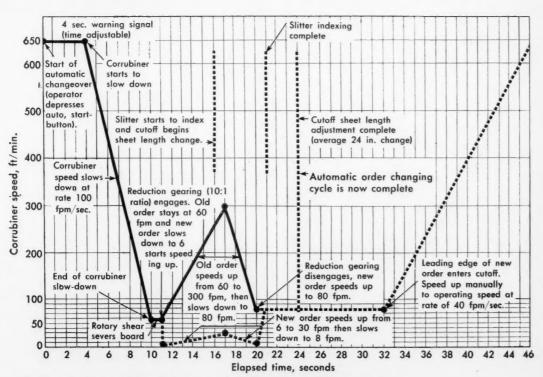
Time-controlled switching requires setting the machine for the maximum time required for any operation.

Three important units of the 325-foot long production machine are involved in the automatic changeover cycle-the double backer which contains the board drying and cooling sections; the triplex slitter, which slits and scores the continuous moving web of corrugated board; and the rotary cut-off, which cuts the slit and scored board into individual sheets. The operator preselects the direction of index for the slitter and the length of sheet on the cut-off for the incoming order. By counter or manually, the control warns when the end of the run is near; the operator has only to press the start button at the conclusion of the run to actuate the automatic order changeover. At the reduced changeover speed, the paper is severed and the runout accelerated while the incoming paper is slowed. Then the slitter is indexed, cut-off length adjusted and the speed brought up to run speed of the new order.

If it is necessary to stop the sequence at any step, an emergency button stops the double-backer dc. motor and the automatic changeover controls. The pre-set information is cancelled while the sequence may be continued manually.



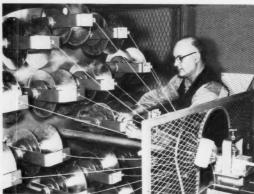
Step-control switching is arranged in upper bay of control box which also contains relay and panel circuits,



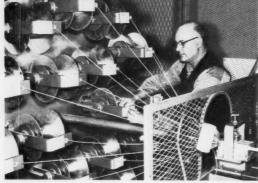
Elapsed time of 32 seconds is needed for complete changeover. Broken line indicates incoming order, shows how clutch and gearbox control speed to runout



#### **Designews**



Space age spinning wheel turns out multi-wired cables destined for missile blockhouse electronic circuits.





One of the new Rolls Royce RB 163 Spey by-pass jet engines now being flight tested in an Avro Vulcan.



Canadian-made 36-inch valve for pipe line installation by Alberta gas companies.

extruded stainless steel sections make up this stairway railing.

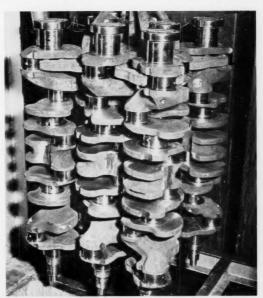
#### in pictures



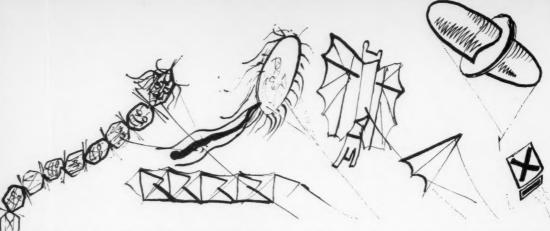
Plastic laminate suit developed for rocket fuel handlers is being adapted for other industrial uses.



Artist's impression of U. S. Navy's radio telescope under way in West Virginia. Black dot in right corner is a car



Diesel crankshafts are toughened by molten salt-bath process introduced to America from West Germany.



MAN / Problem solver was the theme of the 11th International Design Conference in Aspen; fifteen specialists analyzed approaches to problem solving within their own particular fields; also the International Kite Design Contest was held as part of the conference; one of seven Canadians attending, Frank Davies, took part in both events. He reports . . .

Three hundred and eighty men gathered recently to debate man's ways of solving problems—and flew kites.

Figuratively, their kites were part of the 11th International Design Conference and took shape as the delegates sought insight into their own problems by looking at problem-solving techniques of other fields and cultures. The theme was "Man/Problem Solver."

Literally, their kites were part of the International Kite Design Contest, and included a huge man-carrier, fighter kites which sever opponents' kite stays, and flights of fancy which never took flight at all.

The 380 comprised industrial designers, engineers, editors, architects, art directors, artists, college professors, company presidents, mathematicians, semanticists, philosophers, musicians, poets, behavioral scientists, an ophthalmologist, two marine biologists and a missile designer.

Canadian designers who attended reported the environment at Aspen, Colo., added greatly to the success of the conference. It took place in a white-and-orange tent, designed by Finnish architect Eero Saarinen, which is a practical example of solving a problem in temporary contemporary architecture. Erected over a huge concrete dish that gives the tent excellent acoustics, it is gay, light and stimulating. Glimpses of the Rocky Mountains which surround the valley are built into the design solution.

Each of the speakers presented a written paper, spoke and participated in small seminar groups. Several gave additional material in the form of exhibits, films, recitals and slide presentations.

One of the main themes was set by Dr. Tomas Maldonado of Buenos Aires. He attended as head of the Research Institute for Industrial Design at the Hochschule fur Gestaltung in Ulm, Germany (successor to the Bauhaus). He took a long view at industrial design, saying the two approaches to solving problems today are dependent on conventions in the particular field in which the designer is working. One is the engineering approach, which holds that to resolve a problem in mathematical terms is to have it almost solved, the other is that all problems are solvable by common sense and good taste.

Maldonaldo said neither is realistic, and the future designer must move from his position as a solver of other people's problems in their terms, to being free to decide for himself what problems he should solve. This would restore to the designer responsibility to design for human use and not, as was often the case today, for man's abuse.



MILNER GRAY
Royal Designer
"you are responsible for the aesthetics when your designs are produced..."

Milner Gray, RDI, FSIA, AGI, of the Design Research Unit in London, England described his two-pronged approach as analytical and objective, then intuitive and personal; finally, interweaving these.

Gray stressed that the designer has an ethical responsibility for the aesthetics, or lack of them, in his designs when produced, and must be a human being first and an engineer second.

Yuri Soloviev, chief expert on industrial design, State Scientific and Technical Committee, U.S.S.R., could not attend but his paper on the theme that "beauty must be married to utility" was read. He was scathing about the industrial designer who is a "specialist skillful in creating new gadgets," and declared that only rarely can the engineer become an artist—the artist has to become an engineer to become a designer.



DR. KRONFELD
Ophthalmologist
"... We perceive only what we expect ..."

Kronfeld, as a research ophthalmologist, described a person's response to visual stimuli and illustrated this point with new techniques evolved to observe the eye itself. Man now can gain knowledge by using super-

sensitive TV to view inside the human eye at light levels which entail no discomfort, and therefore no reaction to the examination, he said. Color movies and stereo-techniques all yielded what was hitherto undiscernible.

The theory that research itself interferes with the process being examined was brought out in an entirely different field. Edward Bursk, editor of the Harvard Business Review, described this as a problem in industry and business. In science, he said, you eliminate variable; in art, you make your own variables; in politics, you gauge the balance point of compromise between the variables, but in business you accept all the variables. You accepted error in assessing all the variables as part of the risk integral to business.

Prejudice is often a barrier to solution, claimed Anatol Rapaport, musician-mathematician-semanticist.

To illustrate he posed a problem.

Two players have red and green cards which they play independently. If both play red, each loses \$1; if both play green, each gains \$1; if only one plays red, he gains \$2; the one playing green in that case loses \$2. How does one gain?

Logically and mathematically there is no solution, for the odds are even. Man's cultural presumption that one must gain at the expense of another prevents him seeing the simple answer, said Rapaport. The answer is that if each plays for the common good, each plays nothing but green and gains \$1 every time.

#### BERNARD RUDOFSKY Architect

"We have handed over the problem of food clothing and shelter to the hucksters..."



The overlooked obvious was behind architect Bernard Rudofsky's plea for a fresh look at abandoned solutions. "We have walked away from basic problems of food, clothing and shelter . . . The Western concept of waste to keep production growing has overflowed into the preparation and distribution of food so that we plan to throw away a portion of each meal as a matter of course."

Clothing, said Rudofsky, is so invested with taboos that the comfort of the wearer is not a primary consideration. Neither was ease of changing, cleaning or manufacturing. In shelter, privacy was at a primitive level. These things were no longer seen as problems because they had been handed over to the huckster.

"We can land in jail for poking fun at a New York State Neapolitan Rhine wine though we can condemn with impunity a play, a poem, a painting. We ignore our polluted rivers, eroded soil and steaming dumps and fix our gaze on conquering ever less hospitable properties such as the moon and the stars. We are the kindred souls of the 18th-century aristocrats who solved cleanliness by dousing in perfume to cover up the stench of their bodies."

Richard Morriss, a U. S. sociologist, suggested the designer is not always working toward our freedoms.

". . . The designer giveth but he also taketh away alternatives. He makes it possible to have a Martini 15,000 feet in the air; he makes it impossible to drive slowly on a freeway. He makes it possible for a whole family to get away from it all in a home on wheels; he makes it impossible in a permanent house to get away from that family except in the bathroom."



#### BERNARD BENSON Engineer

"Break down your problem into smaller ones tackle these in related groups . . ."

Engineer Bernard Benson (inventor of the first acoustic homing torpedo and now head of a corporation specializing in data-processing systems) described his

logical process.

He said he isolated goals into true, immediate and apparent goals—and red herrings. Then he decided which of the apparent and immediate goals were worth including in the package goal. Then came an analysis of the barriers between the status quo and the ultimate goal. These were considered in turn and examined for ways to bypass or overcome them. All were broken down to component problems, then divided and subdivided down to fundamentals.

Similar fundamentals could be grouped so that experience gained in one solution could be immediately tested against similar problems. Each solution was looked at as an immediate solution and in the light of the final goal. As each small problem was solved, the larger structure grew till the final answer was achieved.

Benson lamented the homogenization of society, a process in which no cream comes to the top; the inter-dependence and cumulative responsibility which developments of transportation and communication create; tolerance of errors (part of the philosophy of waste), and intolerance of the individual accepting responsibility (part of the leveling-out process).

Toronto-born educator-philosopher Dr. Harold Taylor, the keynote speaker, said:

"Twentieth century man has been incredibly successful in solving the secondary problems of scientific advance and technical progress. He has failed to solve the major problem of building new institutions to contain the force of the advance. As a result the liberal values and the humanitarian ethic which alone can make the new world richly habitable are on the defense and fighting for their lives . . .

"It is the failure of the educated (designers, architects, writers, businessmen . . . all who fall between the masses of the world's people with their needs growing daily more desperate, and the governments who control through use of weapons, mass-communication media, threats and military strategy) to commit themselves to this responsibility which is our greatest problem . . ."

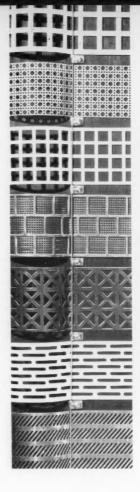
Summing up the conference at the end, Taylor reiterated that a major problem is isolating the right problem for each to tackle. The question had to be stated in terms which did not modify or even cancel out the solution. Verbal symbols covered truths rather than revealing them.

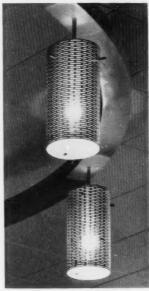
He warned that past heritage contains all the errors of the past as well as its wisdom and that wisdom for one era is not necessarily applicable to the next, whereas errors have a way of being destructive every time.

The kite design contest had not been held since 1955. The gentle summer breeze through the Aspen valley grew to gusty gales on the flight day and most of the less robust kites were reduced to shreds and crumpled examples of unsolved problems. The winners included several new applications of multiple-wing constitution.

# There's plenty of scope in this creative medium for designers

The ingenious designer can find a use for perforated materials in almost any industry he cares to name





Wide dispersion of light without glare is achieved using light-weight perforated metal.

"Versatility" is the word which best describes perforated materials. Their usefulness is limited only by the ingenuity of designers.

Perforated materials are not exactly new. They have been used for centuries . . . and many of the historic attractions of the continent of Europe owe part of their beauty to the hand-worked perforated materials of the age in which they were created.

Today, perforated materials are continually finding new applications in such diverse industries as food processing, mining, furniture manufacturing and ship building. They are proving their value in the manufacture of machinery: for ventilation grills, guards, strainers and for working parts such as the rotary barrels incorporated in many laundry units. Perforated selector screens of every description are being used in mining and milling. And perforated panels are stopping noise and dispersing light in aircraft, buses, ships and buildings.

#### But why perforate?

The simple process of perforating adds in numerous ways to the engineering usefulness of a material. Besides improving the appearance of what would otherwise be a flat, featureless surface, the most obvious effect is the reduction in weight. Square perforations can reduce weight by as much as approximately 70%.

But, depending on the final application, it is the other effects which are generally most useful. The process of cutting a pattern of holes makes a sheet of material into what might be termed a component a component which can disperse light, absorb sound, screen liquids or solid particles and pass air for ventilation.

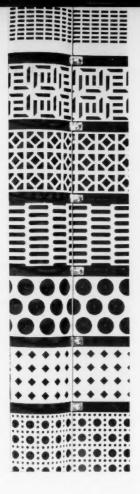
Any material that can be die-cut can be perforated. This covers the great majority of metals, synthetics and fibres. Stainless steels, Inconel, Monel and titanium are a few of the metals, besides common mild steel, which have been perforated to serve a variety of purposes. George McKenzie, who supervises the perforating department at Donald Ropes & Wire Cloth Limited, Hamilton, says: "People are always coming around with new materials. So far we have been able to perforate every one of them."

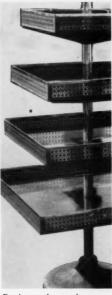
#### For acoustical panels

With management keenly aware of the effect of noise on efficiency, the elimination of noise has become a prime consideration in design. Perforated panels—especially metal panels backed with a sound absorbing material—are becoming popular for this purpose. They are moderate in cost and are tough and very attractive.

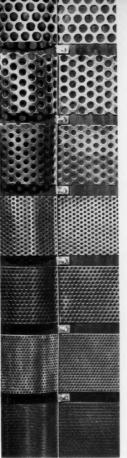
Another application for which they are particularly suitable is covering ceiling sprinkler systems. In case of fire, the sprinklers work fine.

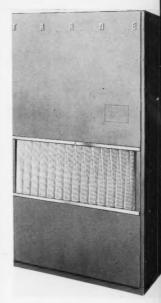
The interior walls of the Shakespeare Memorial Playhouse in Stratford, Ontario, are covered with per-





Perforated metal shelves are easily kept clean, need no maintenance.





A sample, like that on our front cover, forms the grille for a refrigeration unit.

forated metal panels. They were also specified for the new Hamilton, Ontario, City Hall.

But perforated panels are certainly not limited to the covering of walls and ceilings. For example, the Wichita, Kansas school sytem is using language booths incorporating perforated steel acoustical partitions. This design is worth spending a few words on because it could easily be adapted to isolate some other undesirable noise source.

With noise always a problem, especially in offices where typewriters and business machines are constantly chattering along with their operators, easily fabricated partitions come in handy. If for nothing else, they can be used to divide the operators and stop their chattering.

The Wichita language-booth partitions are made up from 22-gauge perforated-steel sandwiching glass-fibre batts. Two three-quarter inch batts are used for each partition, and these are separated from one another by a polyethylene film to eliminate "cross-talk".

#### The reasons for design

The main reasons the designers gave for choosing perforated steel for the language booth partitions would apply to any similar design.

First: perforated steel allowed the construction of a more compact and more efficient unit. Compared with the next alternative material (pressed fibreboard with three-sixteenth holes on one-half inch centers), perforated steel offered over three times more open space for sound absorption. Also, because of its thinness (22-gauge), almost the entire thickness of the partition could be filled with sound-absorbing material.

Second: the finished job cost less due to manufacturing economies. This was managed by making use of the structural qualities of the steel sheets. The edges were bent to provide stiffness and low-cost spot welding was employed.

#### For things of beauty

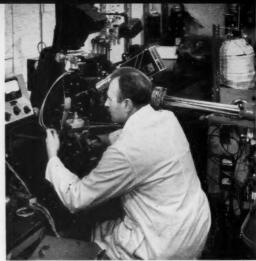
The decorative advantages of perforated materials are especially valuable for the design of beautiful, functional lighting. Dispersion of light without glare is greatly aided when the light source is placed behind a perforated shield. The outcoming light illuminates the shape of the perforations, creating a very pleasing effect, and this effect can be varied according to the many shapes and patterns available. Broad scope is allowed the designer's creativity in combining lighting arrangements with wall and ceiling paneling.

The decorative advantages are also being exploited in the construction of shelving and racks. The perforations facilitate the attachment of hooks and fasteners, and allow the passage of light and air which can be valuable in crowded quarters. By the use of slotted-angle to edge perforated sheets, adjustable shelves can be attached. Because of their strength and lightness,

sizeable assemblies can be easily moved.

## Research centre to serve Canadian industry

Ontario Research Foundation paves the way for a more concerted R&D effort from coast to coast



ORF's specialized assembly for filming electrodisposition processes at high temperatures.

Research and development by Canadian industry is due for a big lift if Ontario Research Foundation goes ahead with a plan for the nation's first Research Community. The Foundation has rolled up its sleeves to begin investigating the physical requirements for a Research Community, and it may not be long before the proposal becomes a reality.

ORF, a self-governing research institute, plans to locate the Research Community in the Toronto-Hamilton area, but this in no way will confine its facilities to local industries. To the contrary, it should encourage many a company from coast to coast to carry out its research projects within the Community.

Just what is a Research Community?

It can best be described as an area set aside solely for the location of R&D facilities. In this case, ORF intends building its new headquarters there to provide specialized know-how to the private laboratories requiring it.

No ground rules have been established, as yet, but the three basic working arrangements envisaged are:

- Individual companies could work independently of ORF, yet call on the Foundation's experience. ORF would place its more specialized equipment at the disposal of private firms not able to afford it themselves.
- ORF research teams would be available for working in conjunction with private research teams on specialized projects.
- ORF would undertake entire research projects on a contract basis.

A Foundation spokesman, however, made it clear that even when the ground rules were formulated they would be flexible enough to allow working arrangements to be tailored to the particular needs of any industry.

Industry's sanction

The Research Community concept has been a favorite of ORF's Board of Governor's for the past several years. Since the Foundation is now bursting at the seams, thanks to many new R&D contracts with private industry, it is forced to look for new premises. And it was this happy combination of circumstances that prompted it to go to private industry last year to

survey the active interest in a Research Community. Of 64 companies questioned, only one did not see the facility as a constructive medium for Canadian industry

A welcome sign was the 40% who indicated that existence of a Research Community in the Toronto-Hamilton area could influence their future plans for new or additional research facilities. Others apparently were adopting a wait-and-see attitude until several factors, contingent on their participation, were resolved: (a) actual location of the centre; (b) when it would be established; (c) costs involved and committments and privileges of member companies; (d) scope and method of operation with emphasis on ORF's role as principal element; and (e) measures adopted to ensure security of information.

#### In good hands

The almost unanimous approval from industry indicates there is no serious doubt that ORF is the right organization to foster establishment of what could become Canada's main R&D booster. It is well qualified to act as consultant to industry. A staff of engineers and scientists with wide experience in many fields is headed by a down-to-earth physicist, Doctor A. D. Misener. As ORF director he is a man of action who has a skilful knack of combining practice and theory. Under him, as assistant director, is Doctor A. E. R. Westaway and the nine directors who lead research in the departments of engineering and metallurgy, chemistry, physics, textiles, biochemistry, field services, parasitology, mathematical statistics and physiography.

In the past ORF has provided numerous companies, from the very small to the very large, with services ranging from technical information and literature surveys to feasibility studies and specialized testing. It has an extensive technical library and specialized equipment including an electron microscope, and spectrographic and chromatographic devices.

If the ORF scheme comes off, it will be the first not to be initiated by a university. Research communities already operate at Princeton, North Carolina and Sterling Forest (New York) universities. But the Research Community itself can create the environment and atmosphere necessary for stimulating scientific discussion and thinking, and this is what ORF is relying on.

# Hamilton — city of engineering firsts

Ontario's ambitious city has been, and still is, Canada's industrial pioneer



New Hamilton City Hall was first Canadian building to use 1,500 cps power for office lighting,

Hamilton, Ontario, calls itself the "City of Firsts". And rightly so, for it can claim the first in many things, like Canada's first fire engine, or even Canada's first woman cabinet minister (Ellen Fairclough).

But in the field of industry it can produce records of even more eye-opening achievements, such as new products which were not only the first in Canada, but the first in the world.

Everyone who travels on a railroad sleeping car, or eats in the dining car is benefiting from an idea conceived in Hamilton. The world first learnt of the illuminating properties of natural gas in Hamilton, the world's first coal oil burner was made there, and it's the place where acetylene gas was discovered.

Today this bustling city of steel mills and sprawling factories stands proud in the knowledge it pioneered the way in many fields of Canadian industry.

Perhaps one of its earliest achievements was the introduction of the friction sulphur match to North America. In 1830, an English family settled into their new abode on Main Street (near Cherry) to begin plying a trade they had learnt back home in a town where the lucifer was apparently invented. By day they churned out their new product and went out at night selling from door-to-door. The obvious advantages of such an idea created a steady demand, until today, modern man would be lost without his book of matches.

The match, not long afterward, proved a boon in finding uses for natural gas and coal oil. The properties of natural gas as an illuminant were first demonstrated in an old mill at Mount Albion in Hamilton district. When coal oil was discovered between London and Detroit, Robert Younger and his brothers were not long in producing the world's first coal oil lamp in their workshop at Elgin Block on John Street.

And just about the time all this was happening, a young York Street chemist, Charles Wilson, was emptying out two chemical jars when he was startled by an explosion. Thus the discovery of acetylene gas which had resulted from a combination of the two chemicals. (No wonder the city introduced Canada's first fire engine in 1843.)

#### Mayor was inventor

One of Hamilton's proudest achievements was the work of its second mayor, John Fisher, whose round-the-clock toil on a strange-looking machine went almost unnoticed as Upper Canada was preoccupied with rebellion, But today Canada's farming community is more than thankful to him as the inventor of the threshing machine. Without financial assistance he persevered to see the machine eventually go into production.

Hamilton has always been a manufacturing city. In 1840 the first iron steamboat to sail on fresh water in America was produced there. This was followed by Canada's first locomotive, and in 1861 by the first sewing machines which were ultimately turned out at the rate of 1,000 per week by Ray Wanzer, an immigrant from Buffalo.

Later in the century Canada's first long-distance telephone line was installed between Hamilton and Dundas, the nation's first public telephones were put into operation in the city, and the first file ever made in the country was a Hamilton product. In fact many things, right down to Canada's first ice cream cones saw the light of day in a city that has just put up one of the nation's most ambitious city halls.

The local daily newspaper, Hamilton Spectator, which dug out many of the facts about the "famous firsts" calls Hamilton "The Ambitious City."

#### Industry warned to wash its face

Canada's chief trustbuster, David Henry, at right, challenges industry to polish its tarnished corporate image to demonstrate the sincerity and integrity of private enterprise

#### By Richard Gwyn, Ottawa correspondent

Canadian industry has been given clear warning of impending trouble—a threat that strikes not at profits but at the independence of private enterprise.

The warning comes from David Henry, deceptively mild-mannered director of the Combines Investigation Branch.

Mr. Henry warns in clear and unmistakable language that industry must convince the public its ethics are clean and its house in order or risk having the Government step in to do the job.

In a recent speech to the Rotary Club of Montreal, he went straight to his point:

"Today I am going to issue a challenge to Canadian industry. It is a challenge that may require considerable soul searching to meet.

"I am going to call on industry to demonstrate to the rest of Canada that business today is being conducted in an atmosphere of vigorous competition and with due regard to the public interest.

"There is increasing public concern, which I think must be apparent to all, that free competition, as at present understood and practised, is not being applied in the best interests of the public.

Mr. Henry then referred to the convictions of major electrical companies in the U. S. for widespread price-fixing and said these had "seriously impaired" public confidence in the ethics of industry.

He pointed out there were two sides to the question. Businesses naturally exist to make profits and satisfy shareholders, considerations which have to be balanced against the general interest.

But the director added: "In my judgment the public has some justification for the increasing concern that is being exhibited."

#### Public interest in price

Industry, he noted, asserted there was keen competition at all levels, but while this might be true in matters such as delivery, service and so on, "the general public is interested in price to a far greater degree than is perhaps recognized.

"I think it is not going too far to say that unless industry takes its own corrective measures, the future of private enterprise itself will ultimately be at stake.

"The more industry carries on activities which, though not at present unlawful, are generally regarded



as not in the public interest, the more industry will find itself faced with increasing intervention by governments in its affairs," he added.

Although not mentioned by Mr. Henry there have been in recent years several examples of this very type of development.

Changes were made in the Combines Act last summer very largely as a result of an enquiry into allegations of discriminatory pricing practices in the grocery trade and the work of the Price Spreads Commission. No actual illegal activities were uncovered but the Government nevertheless took action to protect what it considered was the public interest.

In the United States Senator Kefauver has called for identical tenders to be considered **prima facie** evidence of price-fixing.

Public attention in the current enquiry into the manufacture and sale of drugs has been centred on charges that drug prices are too high. In fact the price of drugs is the concern of the combines laws only if collusion to fix prices or restrain competition is involved. Yet CCF MPs are urging the Government itself manufacture drugs to force down commercial prices by competition.

Government intervention to create a state of price competition can come in many ways. One of the most effective is to drastically reduce particular tariffs to allow entry to lower-priced imports.

#### Hard-hitting speeches

Mr. Henry took over his job as combines director just one year ago. Since then he has gradually come more into the public eye through hard-hitting speeches to trade associations and particular industries or business groups. The Montreal speech culminates all others.

A tip-off that the Government is swinging round to this view will come if Justice Minister Fulton, as a politician and senior cabinet minister, starts making speeches along similar lines.

Mr. Henry is restricted by his position as a civil servant. But he is in an ideal spot to gauge public opinion and the views of business and industry.

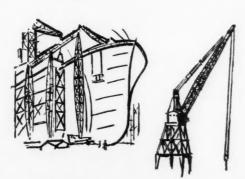
He left industry with these suggested principles: integrity; a sound philosophy of public responsibility; respect for the law; self-discipline and vigorous but fair competition.

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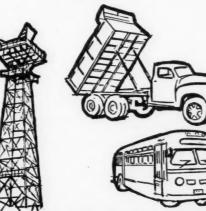
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Preview of a show which is brim-full of vital information on the modern materials needed in today's missile age

An educational "short course" for metalworking executives and design engineers. That's the most appropriate way of summing up the 1961 Metal Show to be held in Detroit's Cobo Hall from October 23 through 27.

Visitors will be able to evaluate the most advanced engineering materials and processes in 275 exhibits and more than 200 papers to be presented at technical sessions in conjunction with the show.

To give a lift to the educational theme, the show's major sponsor, American Society for Metals, has planned a Materials' Application Center covering 12,000 square feet of exhibit floor space. An artist's impression of the Center tops this article. Seven groups of engineering materials will be presented for comparison of more than six specific properties. As well, scores of sample parts, components and test specimens will be brought together under the 30-foot arches.

#### Ten technical societies

Ten American technical societies have joined forces to participate in the Congress program which will comprise 68 half-day sessions. The Congress will begin Saturday October 21 with a seminar on ultra-high purity metals. There will be morning and afternoon sessions on both days of the weekend.

ASM's Engineering Conference will get underway Monday and continue till Thursday with sessions on cold forming of metals, new metal removal techniques, nonmetallic materials and light metals. Transaction sessions of the ASM will be held concurrently with the Conference with papers covering more highly technical aspects of metal science, including nuclear and spaceage metals.

Participating with ASM in joint sessions will be American Welding Society, American Gas Association, Metal Powder Industries' Federation, Metal Treating Institute, Special Libraries' Association and Ultrasonic Manufacturers' Association.

Finale of the program will be a special ASM session on "Economics of Literature Searching in Research and Engineering."

#### The missile market

Social high-point of the Metal Show will be the annual ASM Banquet to be held on Thursday evening, Oct. 26. Keynote speaker at the Banquet will be the four-star boss of America's missile program General

Bernard A. Schriever, who will discuss development of materials to withstand the incredible temperatures and stresses of outer space. He will speak with expert knowledge gained from experience as a guiding force behind the entire U.S. ICBM program. It was under him that the Atlas, Titan, Thor and Minuteman missiles came into operational readiness.

General Schriever's message will be of particular interest to materials and process engineers since one of his latest responsibilities has been research, development procurement and production of present and future aerospace vehicles. And he is sure to be able to speak in the language of an engineer as well as a soldier since he is science graduate. A spokesman for the ASM says Gen. Schriever will be able to supply facts and figures on projections as well as current needs. This is vital information in view of today's opening markets for defense production, a field that Canadians are trying to enter with the help of the federal government's defense sharing arrangements with the United States.

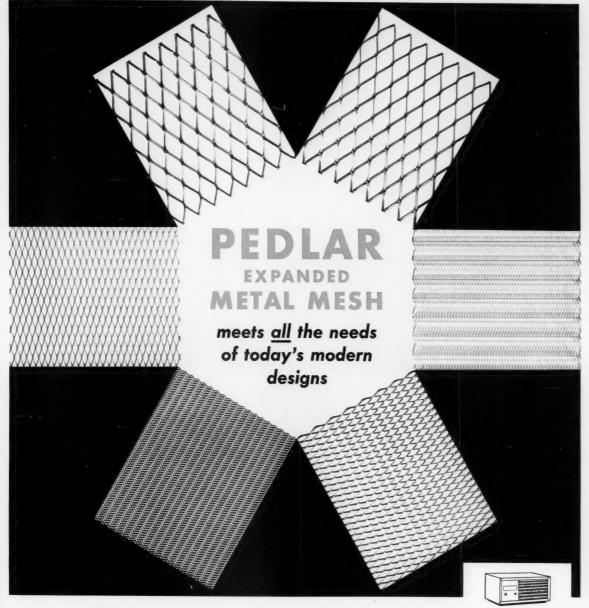
#### Canadian exhibitors

When the Metal Show opens on Cobo Hall's spacious exhibit floor, thirteen Canadian companies will be out to win the attention of the U.S. market. The Canadian Department of Trade and Commerce has bought a big slice of floor space for a composite national exhibit. It is leasing sections to the thirteen individual Canadian companies. They are: Atlas Steels Ltd., Beautylink Fence & Wire Ltd., Dominion Foundries & Steel Co., Dominion Magnesium Ltd., Eldorado Mining & Refining Co., Electrolyser Corp. Ltd., F. Fentiman & Sons Ltd., International Nickel Co. of Canada Ltd., Metal Atomizing & Processing Corp. Ltd., Metal Powders Inc., Tool and Die Manufacturers Association (Toronto and Windsor Chapters), Noranda Mines Ltd., and Sherritt Gordon Mines Ltd.

#### **Exposition hours**

The Metal Show, itself, opens at 10 a.m. every day from Monday through Friday closing at 6 p.m. on Monday and Thursday. It will remain open till 9.30 p.m. on Tuesday and Wednesday but will close early at 5 p.m. on the Friday.

Daily congress sessions will be held between 9 a.m. and 2 p.m. each day.



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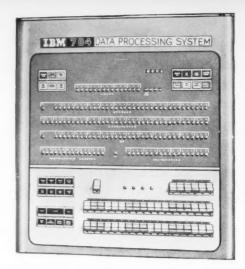


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## The answers on stainless steel

Now check your rating. Here are the answers to the questions on page 48.

Question 1: Are all stainless steels non-magnetic?

**Answer:** No. Only the austenitic types which contain a minimum of 17% chromium plus a minimum of 7% nickel or an equivalent amount of nickel and manganese.

Question 2: What elements are added to stainless steels to make them free machining?

Answer: Selenium or Sulphur are the two most common additions. In, the case of sulphur additions, the manganese must be high enough to ensure formation of the desired manganese sulphide stringers.

**Question 3:** What is the maximum hardness that can be obtained from a stainless steel?

**Answer:** Type 440 C which contains approximately 1% carbon and 17% chromium can be hardened in a 1 in. section. to Rockwell "C" 60.

**Question 4:** How does the ultimate tensile strength of cold rolled stainless sheet or strip compare to plain carbon cold rolled sheet or strip?

Answer: The average tensile strength of the 18-8 varieties such as 302 or 304 is 100,000/125,000 psi. The average tensile strength of cold rolled steel would be 60,000 psi. The 18-8 varieties are capable of being cold rolled to approximately 300,000/350,000 psi.

Question 5: Galvanic corrosion occurs when aluminum and stainless are in contact in an aqueous solution. Which metal will corrode under these circumstances? Answer: The aluminum being the less noble metal, forms the anode and dissolves. The stainless being the cathode remains unharmed.

Question 6: What is a #4 finish as applied to stainless sheet?

Answer: A #4 finish is a general purpose polished finish produced by grinding with successively finer abrasives and finishing with 120 grit finish.

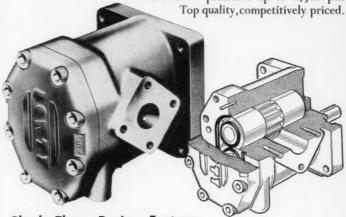
Question 7: What kind of stainless is commonly used for automotive trim? Answer: Type 430 which is a straight chromium type. It can be readily roll formed or stamped and when polished and buffed closely matches chrome plated surfaces.

(continued on page 71)

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Size 4	500 to 1500	up to 45.0	63.5	49.5

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Contact Arrangement: DPDT

Shock: 100 g for 11 milliseconds with no contact openings.

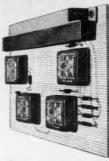
Vibration: .185; max. excursions, 10 to 55 cps. 30 g from 55 to 2000 cps. No contact openings.

Linear Acceleration: 400 g minimum with no contact openings.

Pull-In: 150 milliwatts, approx. (standard) at 25°C. coil temperature. 80 milliwatts, approx. (sensitive) at 25°C. coil temperature

Operate Time: 3 milliseconds max. at nominal voltage at 25°C, coil temperature

Dimensions: .485' high, 1.100' long, .925'



Printed circuit board using 4 FL relays was designed by the Martin Company, Orlando, as part of ground support equipment for a major missile project.

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CRYSTAL CASE RELAY

FOR YOUR PROJECT

Diode in relay case is used for arc suppression in special applications. Four diodes form full-wave bridge rectifier for 400 cycles.





Non-latching or latching relays in conventional crystal cases with or without shoulder brackets, studs or mounting plates. All types of ter minals are available.



Terminals spaced on .200" grids are available on all P&B microminiature relays. These carry a "G" suffix (SCG and SLG) and are .890" high, .800" wide, .400" deep, max.

These 3 relays are shown slightly reduced in size.

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## **POTTER & BRUMFIELD**

M Division of AMF Canada Limited Oxford Street, Guelph, Ontario

# Stainless steel

continued

Question 8: The machinability rating of AISI B-1112 is rated at 100. What is the rating of stainless type 303?

Answer: The selenium bearing 303 has a rating of 75%. Type 416 would rate at 85%.

Ouestion 9: Is a 16-gauge stainless sheet the same nominal thickness as a sheet of mild steel?

Answer: No. Stainless sheets are made and sold to U.S.S. thickness and the mild steel sheets are sold on a U.S.S. revised gauge. The former would be .0625 and the latter, .0598.

Question 10: Are brass and copper heavier than stainless steel?

Answer: Yes. Brass has a weight per cubic foot of 524# compared to stainless steel's 504#. Copper would be 537# per cubic foot.

Question 11: Can square and socket head screws be made from stainless steel?

Answer: Yes. Canadian manufacturers are regularly making these products on standard cold heading machinery.

Question 12: In blanking and punching operations involving stainless, more power is required than for similar thicknesses of low carbon steel. What is the percentage increase?

Answer: The increase is normally figured at 40% for 300 series steels. This will vary somewhat in proportion to the shear strength of the particular al-

Question 13: What grades should be used for large components where extensive welding is involved and post annealing is impractical?

Answer: The stabilized grades 321 and 347 containing titanium or columbium are generally recommended for this type of job. The extra low carbon grades are also suitable.

Question 14: How much does stainless steel expand and contract with heat and cold?

Answer: The nonmagnetic austenitic stainless grades move about 50% more than mild steel with temperature change while the straight chrome stainless steels are just slightly less than mild steel. Aluminum will expand or contract with change in temperature 50% more than that of austenitic stainless steels.

How did you score?



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For further information mark No. 153

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5 models 8 and 28 h.p. with power packed versatility



S-N Reversing Transmissions are performance proven, space-saving single units which reverse under full load. Adaptable to the design or redesign of a wide variety of industrial equipment. For technical data write The Snow-Nabstedt Gear Corp., Hamden, Conn.

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Model No.		5231	5201	5108
Reduction Forward		1.97:1 3.34:1	3.16:1	3.75:1
Ratio Reverse		3.37:1	3.16:1	3.75:1
Power Up To		28 HP	28 HP	8 HP
Max. Input Torque in. Ibs.		1000	1000	320
Max. Input Speed RPM		2400	2400	2400
Dimensions	Long Wide High	15 <sup>11</sup> /16" 14" 14 <sup>3</sup> / <sub>4</sub> "	11½" 13½" 14¼"	9½16" 10" 103%"



# SNOW-NABSTEDT

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Transmission Engineers
For Over Half a Century

For further information mark No. 154

# **Technical literature**

Steel bars—Case study portfolio of machinability and tool life compared with the materials they commonly replace. LaSalle Steel Co.

Circle 302 on Reader Service Card

Pressure regulators—Bulletin 120 detailing four regulators designed for reducing, relief and back pressure applications. Inlet pressures from 200 psi to 350 psi. Canadian Meter Co. Ltd.

Circle 303 on Reader Service Card

Rotary electric actuator—Bulletin 661 describing remote control of a line of selector valves. Railway and Power Engineering & Supply Co.

Circle 304 on Reader Service Card

Liquid & gas equipment—Buyers' Guide describing corrosion-resistant and water treatment equipment. The Pfaudler Co.

Circle 305 on Reader Service Card

Printed circuits—Technical bulletin specifying flexible, flush and multilayer circuits. Litton Industries.

Circle 306 on Reader Service Card

Progressing cavity pumps—Bulletin 150.6 describing a new line of pumps with capacities to 3,000 gph and pressures to 350 psi. The Robbins & Myers Co. of Canada Ltd.

Circle 307 on Reader Service Card

Magnetic level switches—Brochure with dimensional details and wiring diagrams of magnetic level switches. Bestobell (Canada) Ltd.

Circle 308 on Reader Service Card

High Vacuum pumps—Literature describing a complete line of pumps for the high-vacuum components field. Consolidated Vacuum Corporation.

Circle 309 on Reader Service Card

High temperature alloys—Booklet on high temperature and high strength alloys used in aircraft, gas turbine and missile applications. Alleghany Ludlom Steel Corp.

Circle 310 on Reader Service Card

Teflon lined tubing—Bulletin outlining rubber tubing for transmitting food, chemical and petroleum products, paints, pharmaceuticals or slurries. Pennsylvania Fluorocarbon Co.

Circle 311 on Reader Service Card

Semiconductor diodes and rectifiers — 300-page characteristics tabulation on semiconductor diodes and rectifiers covering world-wide specifications. data by 95 percent. Derivation & Tabulation Associates, Inc.

Circle 312 on Reader Service Card

Cooling chlorine — Brochure analyzing costs of four methods for cooling chlorine. Titanium Metals Corp. of America.

Circle 313 on Reader Service Card

Mimick tracing—Folder describing a new concept of tracing. Retour Developments Ltd.

Circle 314 on Reader Service Card

Explosive metalforming — Report on studies made up to March 1961. National Research Council.

Circle 315 on Reader Service Card

Specialty fasteners—Handbook No. 11 with complete data on a wide variety of fasteners. South Chester Corp.

Circle 316 on Reader Service Card

Humidity instrumentation — Condensed catalog listing a complete line of basic hygrometer instrumentation and systems. Hygrodynamics Incorporated.

Circle 317 on Reader Service Card

Centralized lubrication—Catalogue illustrating a line of centralized lubrication equipment from the fully automatic to the manual. Lincoln Engineering.

Circle 318 on Reader Service Card

Polyurethane foam — A booklet with some product ideas using rigid polyurethane foam for thermo insulation. Naugatuck Chemicals.

Circle 319 on Reader Service Card

Displacement pump — Precision pump for metering, injecting, sampling, feeding, mixing, lubricating. Airmatic Valve.

Circle 320 on Reader Service Card

Self-sealing couplings — Showing the common uses in fluid piping systems and the most suitable types. Aeroquip (Canada) Ltd.

Circle 321 on Reader Service Card

Polycarbonate films — A technical report detailing the physical and electrical properties and comparing extruded and solvent cast films. Canadian General Electric.

Circle 322 on Reader Service Card

Noise control — Technical brochure outlining effective, approaches to solving acoustical problems in appliance sand equipment. Owens-Corning Fiberglas Corporation.

Circle 323 on Reader Service Card

# **Technical** literature (Continued)

Granite surface plates-Bulletin detailing reasons for selection of granite surface plates and straight edges. A Ottavina Co.

Circle 324 on Reader Service Card

Solenoid valve selection - A comprehensive study of solenoid valve selection for corrosive applications. Valcor Engineering Corporation.

Circle 325 on Reader Service Card

## Letters to the Editor

#### **Night courses** to attract technical teachers

I have just finished reading your interesting editorial and article regarding the shortage of technical teachers (DE Au-

I think one of the main reasons for this shortage is financial, i.e. most men cannot support their families on \$30 per week for an 8 month period. This factor must cut down the applicants to a fraction of what they would be if it were made easier. Also, why would a man quit a good paying job in industry when he is not sure he will be successful as a teacher?

One way to overcome these problems would be to make the 8-month training course an evening course spread over two or even three years. Doing this would achieve two things: (i) eliminate the \$30 per week allowance, and (ii) assure a steady supply of qualified technical teachers.

E. Curnow

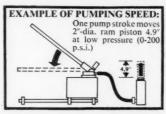
Ottawa

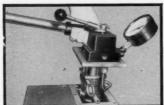


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Pump, valving and controls mount on com-

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Here is a compact, precision-built 10,000 p.s.i. 2-speed hand pump with the ability to deliver exceptionally high volume at low pressure for fast ram approach and return. Handle high-force requirements, yet waste no time getting the ram to the work! Choice of 2-way or 4-way control valve, mounted easily on cover plate; no exposed piping. Unit weighs only 34 lbs.

Ask your OTC distributor about the new OTC "Dualmaster" pump.

## PRECISION HYDRAULICS DIVISION



# New products and materials

#### **Electrical contactors**

The new series of contactors mechanically held in either the open or closed position, eliminating hum. A molded epoxy coil is used for maximum resistance to moisture and insulation deterioration. Zenith Electric Co.

Circle 326 on Reader Service Card

#### **Epoxy** adhesives

A new adhesive with high initial tack strength allowing name plates to be bonded directly to switchgear cabinets or to electrical components without clamping in position. The resultant bond has a high impact strength. **Hysol** (Canada).

Circle 327 on Reader Service Card

#### **Circuit breakers**

A new line of circuit breakers in molded cases to accommodate the rotary handle eliminating handle misalignment and false indication of breaker contact position. A locking ring capable of taking

three padlocks, and a cylinder-type lock which locks the breaker in either the open or closed position, are fully effective whether the enclosure door is open or closed. Federal Pacific Electric of Canada.

Circle 328 on Reader Service Card

#### **Timer motor**



A synchronous timer motor completely sealed by a specially designed spring-loaded packing gland which prevents the oil from working out of the housing when the motor is operating. Key element of the gland is a neoprene "0" ring which is held under constant pressure by a spring. Result is noiseless and vertually continuous lifetime operation. Controls Co. of Canada Ltd.

Circle 329 on Reader Service Card

#### Small filler valve

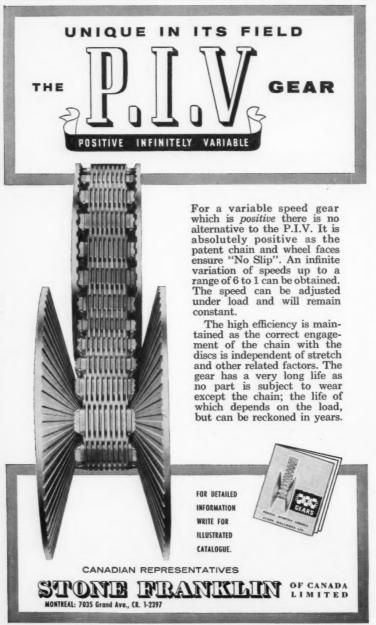


A new miniaturized filler valve for cryogenic, pneumatic and hydraulic applications. Featuring an unusual leakproof design, the female portion weighs only four ounces including dust cover, while the male weighs only two ounces with cover. Airborne Research and Development Corp.

Circle 330 on Reader Service Card

#### Self-balancing calibrator

Instrument for the calibration or direct reading of high resolution transducers or sensing devices such as bonded or un-



# **New products**

(Continued)

bonded strain gauge transducers, thermocouples or other ac or dc voltage measurements, ten millivolts, full scale or above. Automatic and servo-driven, the null balance device gives faster and more accurate readings than the manual instruments. Canadian Research Institute.

Circle 331 on Reader Service Card

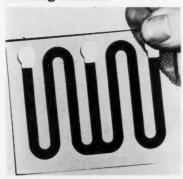
#### **Ferrous filter**



A combined ferrous trap and filter for installation on lines carrying various liquids or slurries to remove both iron contamination and non-magnetic particles. Heart of the new trap is a 1 inch stainless steel permanent tube magnet enclosed in a 2 inch diameter perforated bronze filter screen with either .020 or .033 inch diameter holes. **Eriez of Canada Ltd.** 

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#### **Heating element**



A compact glass heating element for commercial news as a low temperature warmer or as a spot heater. The unit features a glass panel selectively coated with metallic film applied to form an electrically conductive path. Corning Glass Works.

Circle 333 on Reader Service Card

#### **Plunger relay**

An open construction plunger type relay particularly suitable for heavy duty loads (Continued on page 76) Specialists in Power Transmission 100 years of service to industry

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# New products and materials — continued

such as resistance heating furnaces and drying or welding equipment. With hermetically sealed mercury to mercury contact, it is silent and chatterless. Davis Automatic Controls Ltd.

Circle 334 on Reader Service Card

#### Stable magnet

Permanent magnet with higher resistance demagnetization and substantially higher in both coercive force and maximum energy product. Claimed to have the best magnet stability of any commercially available permanent magnet material. Crucible Steel Co. of America.

Circle 335 on Reader Service Card

#### **Plotting scale**

A versatile graphing instrument which converts a plain sheet of paper into a custom plot with linear logarithmic scales of any length, number of cycles, scale modulus or configuration. Eliminates the need for a big supply of graph papers with assorted sizes and cycles. **Technical Marketing Assoc. Inc.** 

Circle 336 on Reader Service Card

#### Coaxial joint



A new coaxial rotary joint rated for continuous operation at 1,000 rpm from dc to 16 kmc. Special connectors and precise tolerance control result in low vswr. Philips Electronics Industries Ltd.

Circle 337 on Reader Service Card

#### **Printed circuit base**



A new grade of copper-clad epoxy paper base laminated plastic for printed circuits. Has better flexural strength flame resistance and cold shearing properties than normal grades. National Fibre Co. of Canada Ltd.

Circle 338 on Reader Service Card

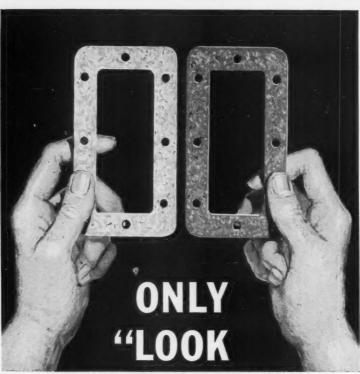
#### **Spring filter**

Permanent filter which makes it possible to clean high volumes of any fluid that can be pumped. The element is based on two interwound springs, one wire coiled around the other. The medium-pressure model will handle line pressures of 1,000 pounds. The Chrom-O-Lite Co.

Circle 339 on Reader Service Card

#### **Heatsink oven**

A combination heatsink and oven eliminates the difficulties of thermal overshoot that occur when standard ovens are used with power dissipating circuitry. Three models are available with power



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# New products and materials - continued

ratings of 1, 3, and 10 watts and heater power ratings of 7, 14 and 28 watts. **Douglas Randall Canada Ltd.** 

Circle 340 on Reader Service Card

#### **Gas regulators**



A new line of gas pressure regulators aluminum bodies and maximum ambient temperature of 200F. Both limited and wide range adjustment models are available, featuring a wide selection of outlet pressure ranges. General Controls Company Canadian Ltd.

Circle 341 on Reader Service Card

#### **Ball-bearing screw**



A new line of ball-bearing screw assemblies. Travel of the ball nut is halted at any position along its stroke where the load reaches a preset amount. The Saginaw Div. of General Motors Corp.

Circle 342 on Reader Service Card

#### Compact circuit breaker

An 800 ampere molded case circuit breaker claimed to provide 1/3 saving in panel space. It is available in two and three pole construction in current ratings of 125 through 800 amperes, for 600 volts ac and 250 volts dc. I-T-E Circuit Breaker Canada Ltd.

Circle 343 on Reader Service Card

#### Impulse counter

A plug-in impulse counter designed to open or close a switch after a preset number of counts. It is spring reset, in 1/3 of a second, to "0" making it applicable to completely automatic control circuits which must function from counts. Davis Automatic Controls Ltd.

Circle 344 on Reader Service Card

#### Low friction bearing

A new recirculating roller bearing

claimed to have the lowest and most uniform friction characteristics available. Coefficient of friction is as low as .00025 under 2,000 lb load and .25 ins. per minute linear motion. **Kaydon Engineering Corp.** 

Circle 345 on Reader Service Card

#### Micro second memory

High speed 1-microsecond modular memory available on a commercial basis. The solid state magnetic core array system has a full read-write cycle time of one usec, with access time of .4 usec. Day-strom Ltd.

Circle 346 on Reader Service Card

#### 5-spool control valve

A new hydraulic directional control valve for mobile equipment. Spools are of optional types: double-acting or push for single action. Nominal rating is 12 gallons per minute. T. E. M. Sales Ltd.

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Complete systems like this one with three power units and three valve panels are the result of planning that begins at initial design stage.

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# **Briefs**

Material oddities: Thousands of pieces of man-made sapphire will cover the surface of the communications satellites now being developed in the U.S.; they'll protect solar cells from space radiation . . . a new superconductor material has been developed which offers no resistance to electrical current . . . a new and simple process for increasing quality and quantity in which pure metals can be produced was described at the Chemical Institute of Canada's Montreal

conference . . . among the new wood products recently discovered, one of the most promising is a kraft thermoplastic paper which can be used for instrument panels, car doors and shoes . . . to increase reproduction of Japan's staple diet, fish, polyethylene film tape is being used as artificial seawed to shelter finny denizens of Nipponese lakes . . . Malayan natural rubber exports showed a drop of over ten percent last year owing to lower-cost syn-

thetic latices . . . The Magnesium Association feels too great a stress has been laid upon lightweight qualities of the metal and will begin a campaign to **promote** other characteristics . . .

Moving ahead: Scotch whisky is literally going to men's heads; a Scottish chemical company uses the spirit as a base for its new masculine shampoo, says it's supposed to stimulate the scalp... and in case you think you're seeing things it is true that all-season tires have been developed with removable treads, according to a paper presented to the conference of the Chemical Institute of Canada in Montreal...

Crystal ball: What the American city will be like by 1980 will be projected in a series of papers at the annual convention of the American Society of Civil Engineers next month... a practical gas turbine-driven truck is planned by a British auto maker for 1964... National Aeronautics and Space Administration forecasts development of a commercial transport airplane to fly three times the speed of sound by 1970-1...

Air pressure: Air-supported structures have been called in to resolve the problem of temporary storage of grain in Mexico, and 47 have already been made in the U.S. . . . air power is used in amazing places; a Montreal firm has made a special air motor with an attachment for shaving pigs . . an old World War II howitzer is now doubling as a pressure chamber in a missiles and space research laboratory in California (old cannon never die) . . .

The atoms: British scientists have designed a pilot plant for converting radioactive wastes into an insoluble glasslike solid which may solve disposal problems . . . Defense Research chemical laboratories in Ottawa are working on a new electrochemically operated radiation dosimeter which may be a boon in alarm monitors and satellites . . . U.S. Atomic Energy Commission has signed contracts for the first phase of development of a nuclear rocket engine ... meanwhile AEC has authorized startup and testing of the reactor in the world's first nuclear cargo-passenger ship N.S. Savannah . . . Westinghouse Electric Corporation, Windsor Locks, Conn., is using the nation's largest beam welding system for making aluminumclad nuclear fuel elements . . .

Talepiece: Think twice and you'll have only half as much to say.

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- 13. Permanent—does not weaken, craze, or discolor with age
- 14. Colorful—any colors or shades can be processed right into the material
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- 16. Excellent non-magnetic properties
- 17. Excellent acoustic properties
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- 19. Runs as low as 500 moldings practicable
- 20. Easily machinable with correct tools
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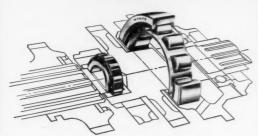
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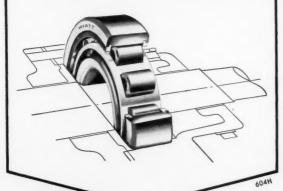
UPTON ROAD, SCARBOROUGH, ONT. Pt. 5-0781

For further information mark No. 147 on Readers' Service Card





HYATT produces 10 major bearing types—four have separable inner races—four non separable and two have separable outer races. The separable race can be omitted and rollers operated directly on the shaft or in the housing bore, in cases where the bearing surfaces can be brought to suitable hardness and finish. Consult R&M about details.





Call R&M for Hyatt-R&M New Departure-Oilite-Heim Shafer-Kaydon-Timken Sealmaster—Torrington
Carbolube—Metaline Weston seals.

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# A tip for selling in the U.S.

Make sure you have approval from Underwriters' Laboratories Inc. before selling in the United States. That's the Trade Department's tip for avoiding costly delays and disappointments.

The Department says Canadian manufacturers are not always aware, until late in their promotion campaign, that products have to be approved by UL be-

fore leading marketing organizations will handle them. It says, although a sample may be sitting on the buyer's desk, it means nothing without UL approval.

Proposed products should go to UL's head office with complete description, purpose, size, rating etc. This is located at 207 East Ohio Street, Chicago.

There is an UL office in Canada,

but its approval is not valid in the U.S. Nor is that of Canadian Standards Association.

Manufacturers can appeal against UL decisions to the National Bureau of Standards.

## **Combines investigation**

Two giant U.S.-owned chemical companies in Canada are being investigated by the Combines Investigation Branch in the manufacture and sale of antifreeze.

Dow Chemical and Union Carbide are involved in the probe of allegations of restraint of competition. The two companies are the sole Canadian manufacturers of ethylene glycol, the main ingredient of anti-freeze.

The inquiry was begun in 1958.

## Canada opens way

Ottawa Canadian government initiative could result in agreements between major producing and consuming countries to settle the problem of low-wage imports on an international basis.

International agreements will be sought similar to those now existing on raw materials such as tin and sugar. These provide essentially an accepted system of pricing and control over both exports and imports.

An agreement on low-wage imports would aim to assure markets for the goods of under-developed countries but keep sufficient control to avoid seriously damaging production and employment in any consuming nation.

For Canada the benefit will be a sharing of the load of competitive low-cost goods which are not now spread evenly among the industrialized nations of the free world.

## Afraid of competiion

Trade Minister George Hees says some Canadian businessmen have become so fearful of international competition that they are unwilling to go out and have a hard try at export markets.

"It sometimes appears to me that our businessmen are allowing their fears of competition from other countries to narrow their outlook," he told the Canadian Manufacturers' Association in Vancouver recently. "This can lead them to underestimate their own capacities to take advantage of new opportunities."

The Trade Department has just published a survey of the main commercial prospects in 102 markets around the world. It shows "definite opportunities" in 1,760 instances.

Opportunities by regions are: 318 products in Europe, 419 products in Asia, 320 in Commonwealth countries, 223 in Latin America and 480 products in the United States.



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# People . . .

# ...and events

# Swing-tail swallows two jet fighters



Ability of the Canadair 44 swing-tail to airlift two complete F-104G supersonic tactical aircraft was proved in a recent demonstration in Montreal.

International government, airline and industry observers watched as two F-104 fuselages with their engines, two tail units and two wing sets were smoothly loaded into the 44's own gaping fuselage.

Proof that the swing-tail can adequately carry them on trans-Atlantic hops should encourage use of the CL44 for rapid economical shipment of complete tactical aircraft to NATO nations to meet urgent delivery schedules. It also makes possible the supply of major subassemblies to meet production shortages in Europe and provides for quick return of large airframe parts or engines for overhaul.

#### Tractors in Brazil

Toronto-based farm machinery firm, Massey-Ferguson Ltd. is to begin manufacturing tractors in Brazil.

This will be the fifth country in which the firm now manufactures.

The Brazil factory, at Sao Paulo, will have a planned capacity of 400 tractors a month. Tractors will be powered by Perkins diesel engines already being made there.

## New gas plant

The largest capacity natural gas processing plant in Western Canada was opened near Rimbey, Alberta at the end of July.

The plant processes gas from both

the Westerose South (Dick Lake) and Homeglen-Rimbey fields and delivers at rates up to 280 million cubic feet per day. 170 million cubic feet of gas per day is fed into the Trans-Canada Pipe Line and the rest goes to the Alberta and Southern Gas Co. Ltd.

A spokesman said it was possible that no other plant of similar size had ever been built with such a high proportion of Canadian-produced materials and equipment.

The plant is operated by British American Oil Company on behalf of a group of 26 owners.

#### Honors

Thomas Elmer Moon, an American engineer who was stricken with blindness at 56, will be awarded the 1961 Holley Medal of the American Society of Mechanical Engineers.

Moon responded to his blindness by developing a machine to help transplant corneas and thus rescue other human beings from blindness.

The Holley Medal is awarded for "an act of genius" that accomplishes "a great and timely public benefit."

# Company takeover

Control of R. H. Nichols Limited, measurement and control engineers, Toronto, has been taken over by senior executives of the company.

Controlling interests were acquired from the founder's family after a long period of negotiations.

The new owners are: S. A. Turn-

penny, A. M. McLeod, A. H. Tuxworth and E. M. MacKinnon. Supporting them is H. L. Roe, one of the company's co-founders. All have been associated with R. H. Nichols Limited since inception.

## **Exporting talent**

Two foremen from Sparling Tank & Manufacturing Co., Toronto have flown to Adelaide, Australia, to supervise construction of a \$40 million oil refinery.

The men, Wayne Compton and Ivan Shook will live in Australia, with their families, for eighteen months while they direct welders, fitters and laborers and train other supervisors.

Plate work for the refinery is being built by Union Overseas Company of Chicago, a Sparling affiliate.

#### Plastic exhibition

The third International Plastics Exhibition "macroPlastic" is to be held a year earlier than planned.

Organizers have announced it will be at Utrecht, Holland from 18 through 25 October, 1962. The international Congress will be held in the days preceding the opening.

The change in plans resulted from decisions to hold two other big plastics exhibitions in Europe in 1963.

An official statement said that reactions from the important plastics countries indicated a show 50% larger than the last one.

#### Men on the move

C. A. Norris, electronics engineer, has been appointed to the administrative staff of Welwyn Canada Ltd., London, Ont.





Hodsoll

Norris

E. C. Hodsoll appointed operations manager Litton Systems (Canada) Ltd., Ottawa.

Ted Larson promoted technical director The Borden Chemical Company (Canada) Ltd.

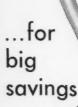
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September 14-15: American Society of Mechanical Engineers, joint engineering management conference, Hotel Roosevelt, N.Y.

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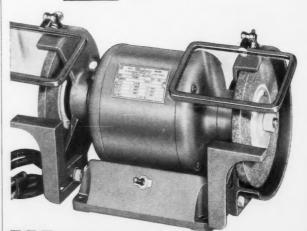
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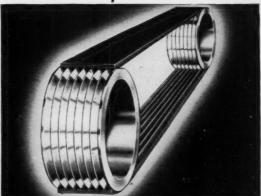


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# backlash

# Microminiaturization

The advent of the transistor has enabled electronic manufacturers to package up to 50,000 parts or components into a cubic foot, and in the immediate future the use of micromodules promises packaging densities of 300,000 parts per cubic foot. Scientists surveying the electronics field, report that densities of more than one million parts per cubic foot will be achieved through molecular electronic techniques by 1965. Costs will continue to shrink as fabrication techniques become more fully automated and precise - however, even today the cost of transistorized military equipment is only slightly greater than the vacuum tube equipment it replaces. Longevity of micromodules also will be a major factor, especially in applications where computers are employed to monitor long and involved production processes.

# Blazing the trail

Once again Quebec's Corporation of Professional Engineers is setting the pace. Earlier this year (see DE August, 1961) the Corporation began its drive to impress on engineering graduates the importance of registration. Now it is going directly to the government for action to conserve Canada's natural resources — a not-before-time duty of all the nation's engineers.

In a brief, monographed by eight individual engineers, the Corporation tried to explain to the province's Department of Natural Resources that "if developed rationally, renewable natural resources are a capital which will yield dividends indefinitely." The Minister for Natural Resources Rene Levesque, and two technical advisers, received the report in person. Such an act augurs well for future collaboration between government and engineers. Congratulations CIPO.

# **Exporting nuclear know-how**

The significance of Canada's work in heavy-water nuclear reactors is becoming clear in a number of ways. One of the most recent pieces of evidence is an approach from the Indian Government for a joint study between the two countries leading to possible construction of a Canadian-type reactor in India.

Canadian engineers have now gone to India to determine over-all costs for the reactor which will most likely be modeled on the Douglas Point Plant expected to be in operation between Kincardine and Port Elgin, Ontario in 1965. The Indian reactor will probably be sited in the general area of East Punjab-Delhi Rajasthan-West U.P.

Canada and India joined hands to build the NRXstyle reactor at Trombay, India which began service in 1960.

# Don't play with fire

Extreme care must be taken when using hydraulic equipment where open flame, sparks or cutting torches can ignite the oil under pressure. As explained in "Do

you know your hydraulic fluids?" in DE's July and August issues, only fire resistant types of oils should be used. The Industrial Accident Prevention Association, Toronto, reports two contrasting stories to illustrate the wisdom of this advice.

Last May a man died from severe burns received when he inadvertently touched an oil line, under pressure, with his blowtorch. The fluid was ordinary mineral oil

The better story is of a machine that blew a valve when the pressure climbed to 2,100 psi. The oil squirted directly into a pot of molten aluminum at 1,300F. The worst that happened was the vaporization which screened off a section of the shop and drenched the owner and operator in fluid. There was no fire and no one was hurt. A fire-resistant oil was being used.

# Who's at fault?

"More and more Canadians are asking themselves how it is that countries like Germany and Japan have recovered so rapidly and spectacularly from the defeat and devastation of 15 years ago." So says the leaflet of The Canadian Manufacturers' Association, "Industry".

It says these Canadians are asking: "Why is it that unemployment in these countries is virtually non-existent, that the shortage is one of workers to fill available jobs instead of the other way around as in Canada and the United States, and that their living standards are rising at an unprecedented rate?"

The answer: above all they have worked hard.

"Industry" then quotes a statement of the kind not too often uttered by present-day unionists, but it's from Charles Luna, of the Brotherhood of Railway Trainmen: "If you ever did a day's work for your employer, do it now . . . Do your work so that no one else does it . . . If the individual had always performed we would all be in better shape . . ."

Whether we wield a drafting pen or a wrench, the message applies to us all.

# A report for management

Here's a report that every engineer and executive in industry should read. It is based on a tour of the Soviet Union made last year by six representative engineers from the U.S., and has been published by the Engineers' Joint Council.

Recent achievements and future goals of the Soviet in the field of engineering and engineering education and manpower utilization are covered. For instance, the USSR annually graduates approximately 117,000 engineers, and plans call for substantial increases in that number.

A section dealing with education describes the amount of specialization required of engineers and technicians. A high degree of practical industrial experience is integrated into the university study program. Sadly, only one university in Canada (University of Waterloo) has any program comparable to this.

Copies of the 112-page report are available in limited numbers for \$1.00, from Engineers Joint Council, 29 West 39 Street, New York 18, N.Y.







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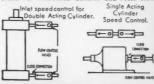
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# **Editorial**

# Button, button who's got the button?

. . . some thoughts on communications of the future

So you think we have mass communications today? Well, indications are that we have seen nothing yet. From all reports, plans for the very near future will do to current wonders what contract bridge did to whist. . .

We have been reviewing some of the innovations that modern design engineers have come up with in communications. Just skimming the top is an experience that hovers between the exhilarating and the downright unnerving in terms of the breadth of change implied.

Television for instance — we'll have it in every room of the house of tomorrow — projected on thin sheets of glass — in color, of course — and taking up no more space than the standard wall thickness.

With TV a two-way communication device (yes, that's coming too), Canadian women will take an even more active interest in those affairs which concern them — like fashions. By pressing a button they will be able to order the dresses of their choice (if they still wear dresses by then), have their order coded on a punched card, and then have the dresses wrapped, delivered and billed . . . by automation. Moreover, the inventory records of the store will be automatically adjusted, and milady will not have to leave the living room to set this whole routine in motion. Dad, as usual, will still be footing the bills.

Just because there will be TV in every room is no reason to suppose the viewer will be forced to spend every night at home. No sir. He will be able to spend the evening out with the boys, and still not miss his favorite programs. The flick of a switch to pre-set the automatically controlled TV tape-recorder will be all that is necessary to preserve the program for review as desired at a later date.

Communications are possible through other media than sight. As indicated by experiments already underway, we'll be able to sniff the perfume of filmdom's glamour queens as we watch them cross the theatre or TV screen. And it has been said that there's nothing like the right perfume to stir up an otherwise disinterested man.

As for books and magazines, the home of the future may well be the focus of millions of them. Once books have been put on microfilm, the possibilities are without limit. The reader of tomorrow will simply dial a code number listed in his personal directory, and this will produce the chosen volume page by page on his home microfilm reader.

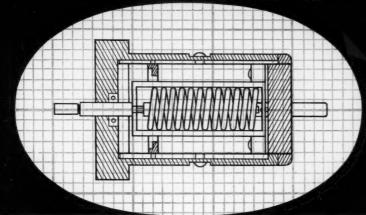
Perhaps the most drastically changed of all the familiar items will be the daily newspaper. It will be delivered without paper (what will happen to our Canadian economy then?) via a private facsimile recorder. The stories will be recieved electronically, complete with color photographs and the late, late news.

These things, I am assured by my associates in communications design, are only a matter of a few years away. Through them mass communications can be either a servant or a monster depending on how well mankind masters the vital secret of a push-button society. Perhaps the designers will go all the way and also devise a means of deciding even when to push the buttons. . . .

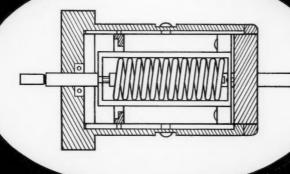
Doug Kaill

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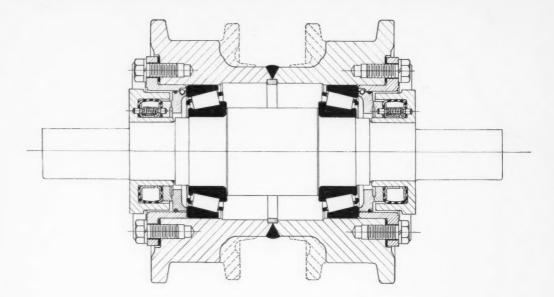
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# How Allis-Chalmers reduces maintenance, boosts work capacity of their crawler tractors



To design *both* greater work capacity and reduced maintenance into their crawler tractors, Allis-Chalmers engineers used Timken tapered roller bearings for the heavy duty track rollers.

Timken bearings work with the steel sealing rings to effect a positive seal that makes one-time lubrication possible. Timken bearings keep all parts precisely aligned. They protect the seal by minimizing side thrust and wobble, eliminate wear that makes bushing-type assemblies impossible to seal positively. And the tapered design lets Timken bearings take *both* radial and thrust loads. Full-line contact between rollers and races provides extra load-carrying capacity—extra work capacity.

And to deliver more power where it's needed, Timken bearings are also used in the bevel and clutch shaft, final drive pinion, intermediate and sprocket shafts, track idlers and support wheels.



**ENGINEERING ASSISTANCE**, early in the design stage, helps manufacturers stretch bearing dollars. Timken bearing engineers have the training to do the job and are eager to help you.



**METALLURGICAL LAB** develops the steels that will make tomorrow's Timken bearings last even longer, help customers to design more economical and durable bearing applications.



Canadian Timken, St. Thomas, Ontario, Canada. Division of The Timken Roller Bearing Company. Timken bearings manufactured in Canada, Australia, Brazil, England, France and U.S.A.

